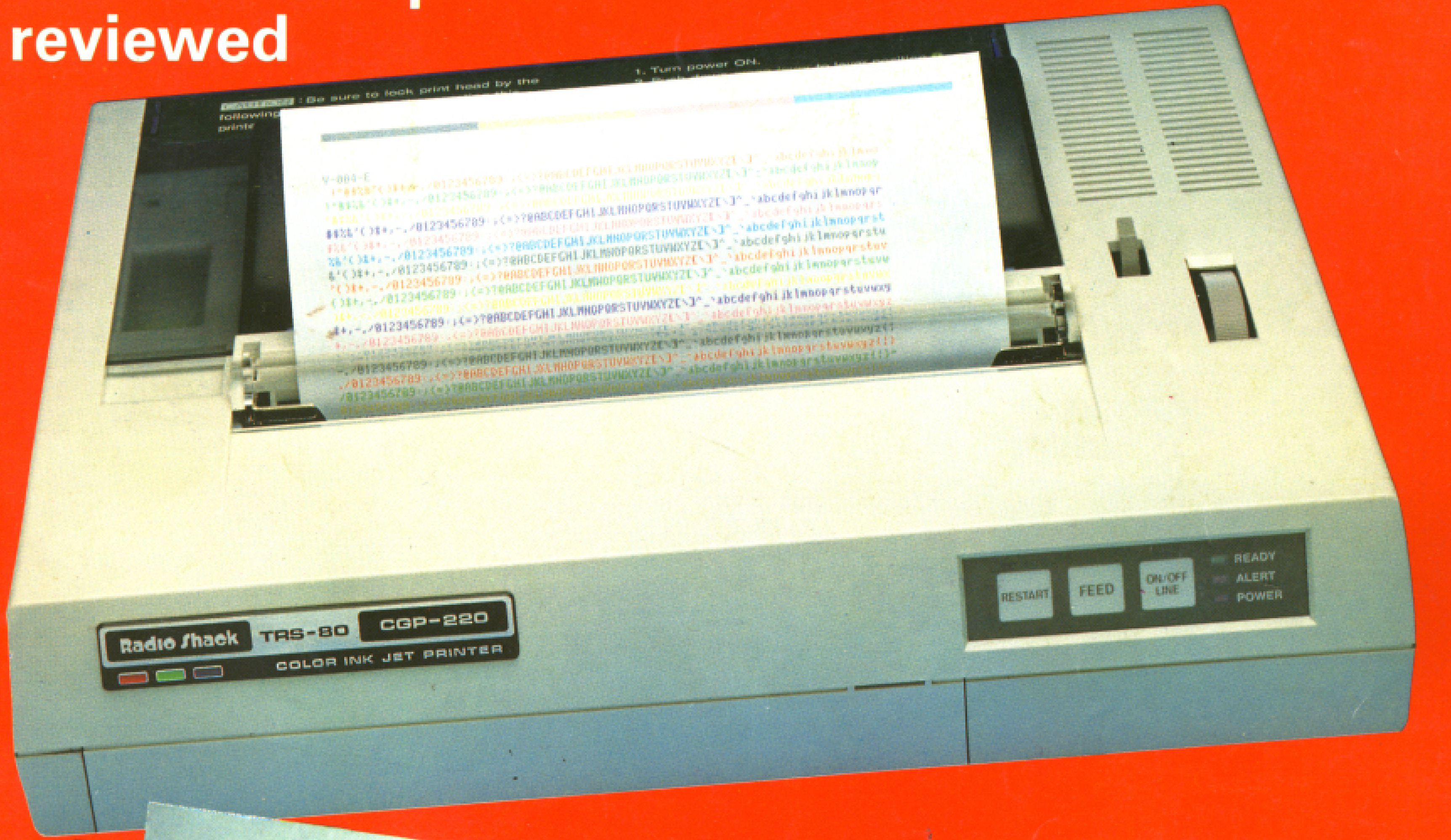
International edition

DRAGON USER

The independent Dragon magazine

75p US$3.25 March 1984

Multi-colour printers reviewed





Win: sprite graphics board from Premier

Banish OM errors

Beat the cube



3D + 2 Screens
Ken Kalish's latest
Steve Baks new
Skramble 5 screens
THE BEST
DRAGON 32
Software
Company
just got
BETTER
DANGER RANGER
MICRODEAL
SKRAMBLE
MICRODEAL
Eight Ball
MICRODEAL
PINBALL
MICRODEAL
Pool on
the T.V.
1st for the Dragon
A real
home
Arcade Pinball game
Air Traffic Control
MICRODEAL
Glaxxons
MICRODEAL
DRAGON HAWK
MICRODEAL
KEN KALISH'S
Devil Assault
From
TOM MIX
MICRODEAL
By the
same
author
as Shuttle
Deadly new
game from
America's Mark
Data Products
Dave
Thatchers
first of
many
3 Screens +
5 Levels
another Ken
Kalish winner
Space Raiders
MICRODEAL
Mark Datas high
quality Space Invaders
Rick Redmans
Real Time Star Trek
in full machine code
SPACE FIGHTER
MICRODEAL
MICRODEAL 1984
41 TRURO ROAD, ST. AUSTELL CORNWALL PL25 5JE. TEL: 0726 3456
On Cassette £8 each
Selected titles available from larger branches of Boots, John Menzies, Spectrum Dealers and all good computer shops

DRAGON USER

Telephone number
(All departments)
01-437 4343
Editor
GRAHAM CUNNINGHAM
Assistant Editor
ANDREW BRIGGS
Software Editor
GRAHAM TAYLOR
Editorial Secretary
CLEO CHERRY
Advertisement Manager
DAVID LAKE
Advertisement Executive
SIMON LANGSTON
Administration
THERESA LACY
Managing Editor
DUNCAN SCOT
Publishing Director
JENNY IRELAND

Subscriptions
UK £10 for 12 issues
Overseas (surface) £16 for 12 issues
ISSN 0265-0177
Dragon User, 12/13 Little Newport Street, London WC2R 3LD.
US address: c/o Business Press International, 205 East 42nd St, New York, NY 10017.

Published by Sunshine Books, Scot Press Ltd. ©Sunshine Books 1984.
Typesetting by Chesham Press, Chesham, Bucks. Printed by Eden Fisher (Southend) Ltd, Southend-on-Sea, Essex.
Distributed by S.M. Distribution, London SW9. 01-274 8611. Telex: 261643
Registered at the Post Office as a newspaper.

How to submit articles

The quality of the material we can publish in *Dragon User* each month will, to a very great extend, depend on the quality of the discoveries that you can make with your Dragon. The Dragon 32 computer was launched on to the market with a powerful version of Basic, but with very poor documentation.

Every one of us who uses a Dragon will be able to discover new tricks and quirks almost every day. To help other Dragon users keep up with the speed of the development each of us must assume that we made the discovery first — that means writing it down and passing it on to others.

Articles which are submitted to *Dragon User* for publication should not be more than 3000 words long. All submissions should be typed. Please leave wide margins and a double space between each line. Programs should, whenever possible, be computer printed on plain white paper and be accompanied by a tape of the program.

We cannot guarantee to return every submitted article or program, so please keep a copy. If you want to have your program returned you must include a stamped, addressed envelope.

Contents

SUNSHINE

Letters 4
Including this month 3D arrays, more on disk drives, Pettigrew's Diary announcement, and hints on loading

News 9
A bumper bundle of releases from Premier plus the latest on the OS-9 and Flex operating systems

On the run 12
This month's software review looks at some of the latest games for the Dragon — a feast for arcade and adventure fans

Software Machine 19
Bob Liddil takes an idiosyncratic look at the new releases in the US in the first of his regular columns

Printer power 20
Michael Watts looks at the possibilities and price of multi-colour printing in this hardware review

Trucking 26
This month's star game sets you up in a truck — the aim is to get as far as you can without running out of fuel or falling to pieces

Rubicube 28
Learn how to simulate the famous cube

The Basic shuffle 33
Banish the OM syndrome and make the best use of available store by taking the guesswork out of allocating your data storage areas

Interfacing 39
Turn your Dragon into a simple storage oscilloscope

Input/output 45
John Botibol puts the record straight on the Dragon's input/output routines

Software File 47
This month's selection from the best of readers' programs — PMODE and PCOPY patterns, Spelling Tutor, saving and filing data, Roadride and Breakthru

Dragon Answers 65
Help is at hand on the string function, FOR NEXT foibles, cartridge addresses, compilers and secrecy

Competition Corner 66
Premier gives you the chance to add sprite power to your Dragon — if you can get lucky at roulette

Editorial

"DRAGON DATA HAS slain the Dragon" was the general response to the announced cost of moving up from a Dragon 32 to the £225 64. But while the comments we received were angry, their number was few — which suggests that most users are content either with the offer or to stay with their 32s.

Dragon Data is offering to exchange a 32 plus £140 for a 64. One reader thought his opinion of this was "unprintable". Less extreme reactions ranged from "outrageous" and "ridiculous" to a more "sanguine" response from readers who have owned their Dragons for longer. One user is "perfectly happy with the idea of a part-exchange but would prefer an allowance of around £100 against the 32 rather than £85". However, his machine "is over a year old and has been used almost every working day since purchase, often for more than 12 hours at a stretch". The allowance preferred rose roughly in proportion to the length of time users had owned Dragons — for example, a reader with a seven-month-old machine would have settled for a £145 allowance, leaving £80 to be paid.

One user was not just annoyed about the money. He thought the 64 couldn't match the competition — "if it had an improved display and sound facilities then perhaps it would be a better proposition". As we said when reviewing the 64, moving up from the 32 would not make sense for many users (do you really need those extra K?). But the 64 is likely to be a much more attractive proposition for certain tasks once the OS-9 operating system and associated applications software are available. The same reader thought it would be better to sell your 32 "and buy a higher specification computer" — although second-hand prices are likely to fall as a result of Dragon Data's decision. He also thought the company should have abandoned compatibility with the 32 to produce "a real winner" — but what price your 32 software then?

One user has already decided to sell his 32 second-hand and "buy a machine from a manufacturer that will be truthful to its supporters". We wonder which one he has in mind and pass on another, partly satisfied reader's comments. "One of the reasons we bought a Dragon in the first place was that Dragon Data looked like a company that wasn't out to rip off its customers. For example, it actually launched the Dragon by selling working computers in shops. You paid your money and carried one away. Your editorial mentioned Commodore. We wouldn't touch Commodore products with a barge pole precisely because of that company's attitude to its customers. Ditto Acorn." The problem for Dragon Data is that many micro buyers either disagree with this reader or also own something longer than a barge pole.

Letters

This is the chance to air your views — send your tips, compliments and complaints to Letters Page, *Dragon User*, 12-13 Little Newport Street, London WC2R 3LD.

Tandy converter

THIS IS the second time I have written to *Dragon User* and I would still like to point out that Basic programs for the Tandy or Dragon can be converted easily by SAVE "x", A. This is very simple to do and it saves painstaking hours of conversion.

Grant Williamson,
Forres,
Scotland.

A SHORT routine enabling programs to be loaded into the Dragon or Tandy Colour Computer regardless of which machine was used to save them would certainly be useful. However, we think CSAVE "PROGRAM", A is a better bet — and remember this will only work with Basic programs.

Increasing arrays

I WONDER whether Andrew Black of the December issue will be pleased or disappointed to learn that his Dragon will not only accept three-dimensional arrays but those of four, five, and more dimensions.

Although I agree with his remarks about the Dragon manual I must say that it was obviously written with the simpleton in mind, and as such it was greatly appreciated by me.

Geoffrey Browne,
New Malden,
Surrey.

Clearing the screen

AFTER reading Alexander's letter about clearing a screen, I wish to submit this short Basic program that sets up a small machine code routine which when called will clear the screen instantly with any desired character:

```
10 FOR A=20001 TO 20013
20 READ B£
30 POKE A,(VAL("&H"+B£)
40 NEXT A
50 CLS:NEW
60 DATA 8E,04,00,86,80,A7,
   80,8C,06,00,25,F9,39
```

Type RUN then press ENTER.
To call the subroutine from within a program, type:
LINE NUMBER EXEC 20001
To change the character with which the screen is cleared, type:
LINE NUMBER POKE 20005, (any number between 0-255)
Example program:

```
10 FOR A=0 TO 255:POKE
   20005,A:EXEC 20001:FOR
   B=0 to 1000:NEXT B,A
```

Alan Devling,
Penrith,
Cumbria.

Machine recoding

BRUCE Devlin's January article on machine code had a mistake while explaining the exclusive OR function. The correct result should be as follows:

```
95 = 0101   1111
53 = 0110   0101
     ———————————
     0011   1010
```

= decimal 106 (&H6A)

Otherwise thank you for a most informative article.

Ian Judge,
St Osyth,
Clacton.

Hints from hi-fi

PERHAPS the following may be of interest to your readers as most of us are not hi-fi buffs.

During a discussion with friends who are not fortunate enough to all own Dragons, the subject of loading errors came up. The problem seems to be quite common and various methods of cure were suggested. However, one method I tried worked.

Hi-fi equipment manufacturers suggest cleaning and demagnetising the cassette heads at a regular period. Naturally I never have and had not noticed any difficulty until I tried to use the computer.

A quick run through with the cleaner/demagnetiser and lo and behold an old cassette player almost on the scrap heap is transformed, no IO errors, just the magical OK and a successful load. Needless to say the unit now lives in the box of leads and will be used regularly.

I must point out that it is essential to demagnetise as well as clean the heads.

Denis Townson,
Crownhill,
Plymouth.

Wind in the drives

WE FEEL compelled to make reply to B Hall of Bristol's grouses on our review of disks (in the January issue).

As we said in the review, automatic creation of a back-up file is useful, especially if you are a sloppy programmer who does not check the directory before saving a file, but don't forget that Dragondos has the much bigger fault of happily allowing you to initialise (erase) a whole disk whether it contains data or not!

Although Dragondos duplicates the directory (but why does it need to?) it does not VERIFY the actual file when it writes to the disk (but only the directory track), so that there is no check that the data itself is OK (what is the use of the index to a book with pages missing?).

It is also of note that you can SAVE a Basic program that does not exist, FWRITE past the end of a file you have CREATEd, and happily FREAD garbage from a file that you have not put anything into.

Of course Mr Hall is entitled to his opinion that the toolkit commands are "surprisingly useful" although we must admit that we are spoilt by using the Premier Toolkit which adds 60 extra commands rather than a mere handful. As Mr Toad said in *Wind in the Willows* "Beep Beep"!

Mr Hall is partially correct in his criticism of our comments on the "simulated random access" file routine on page 2 of the Dragondos amendment sheet as we overlooked the fact that this plays with the file pointers of a SERIAL file automatically.

To return to SPREAD we must point out that this is a two-edged sword, which is causing concern among software houses, as it makes it much more difficult to protect a Dragondos disk against illegal copying.

Of course it is always a case of *chacun à son gout* but when he writes about "user-friendliness" we wonder whether Mr Hall has compared the two systems running in parallel, tried converting existing cassette-based prorams, memorised all the two-character error codes, or found all the bugs in Dragondos yet?

Keith and Steven Brain,
Groeswen,
Cardiff.

Notes on the Diary

WE HAVE an important announcement to purchasers of Pettigrews Diary between October and December. Due to an undetectable duplicating bug, there could be corruption on one line of London Frolics (chapter 2).

If the program crashes with an SN error in 338 please do the following:

1 List the line, to gain information
2 Type the following:
CLS: GOTO 174 (press enter)
3 Continue with the adventure (no information will be lost)

We sincerely apologise for any inconvenience this may have caused.

Now the good news: a follow-up to Pettigrews Diary is planned for release in June.

Steve Maltz,
Shards Software,
Ilford,
Essex.

Bad files

THE TP-10 printer doesn't work on the Dragon — despite Tandy's head office telling us to the contrary. And the Sums Up photo is of an Allyn Software package.

Software Top 10

1	(—)	**Drag Run**	Cablesoft
2	(—)	**Cave Fighter**	Cablesoft
3	(—)	**Cuthbert in the Jungle**	Microdeal
4	(—)	**Ugh**	Softek
5	(—)	**Scramble**	Microdeal
6	(4)	**Ring of Darkness**	Wintersoft
7	(9)	**Frogger**	Microdeal
8	(—)	**Space Fighter**	Microdeal
9	(—)	**Pinball**	Microdeal
10	(—)	**Dragon Hawk**	Microdeal

Chart compiled by Boots

OASIS SOFTWARE

Oasis Software present...

The first basic compiler for the DRAGON 32



SPRINT BASIC COMPILER
by Dr. David Gray FOR THE DRAGON 32

Sprint compiles a subset of standard Dragon BASIC which covers arrays, strings, for-next loops, in fact virtually everything except floating point arithmetic and associated commands. All arithmetic is integer and the Dragon sound and graphic commands are fully supported.
The Technique used is based on the approach used in U.C.S.D. Pascal where the Basic program is first reduced to intermediate code and this is then executed using a run time package which is saved with the rest of the compiled program.

- ★ Programs will run 5–10 times faster.
- ★ Almost the entire Basic is supported, with the exception of floating point commands.
- ★ Code produced will run independently of the compiler (for potential authors!)
- ★ Programs are compiled from tape under remote control so that much larger programs can be compiled.
- ★ Sprint is designed for ease of use and a comprehensive manual is included.
- ★ Free demonstration program with each program bought to illustrate the full power of the Compiler.
- ★ All Oasis products are covered by a lifetime Guarantee.

JUST RELEASED

DRAGON PASCAL £14.95

Dragon Pascal is an extended integer subset of the structured programmed language Pascal. A few of it's many features include:—

- ★ A complete set of structured programming constructs

  IF. .THEN. .ELSE WHILE. .DO CASE. .OF

- ★ COMPILER, EDITOR and SOURCE simultaneously resident for a rapid development cycle and total ease of use.
- ★ Very rapid compilation. Source can actually be compiled more rapidly than it can be listed!
- ★ Fully recursive.
- ★ Supplied complete with sample programs including routines which demonstrate techniques for simulating floating point functions such as SINE and COSINE.

OASIS SOFTWARE Alexandra Parade
Weston-super-Mare Avon BS23 1QT

Please send me

SPRINT Basic Compiler £14.95 ☐
DRAGON PASCAL £14.95 ☐

Name ....

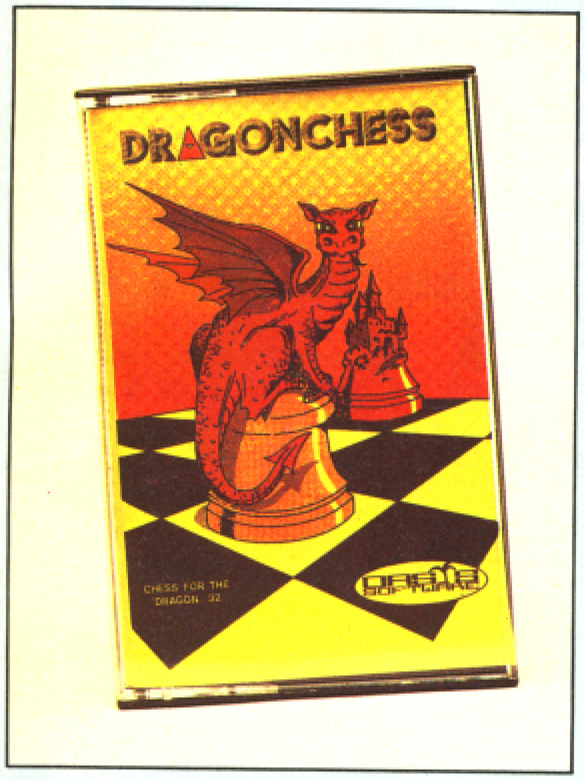
Address ....

....

ACCESS orders
taken by phone
24 hours a day — 0934 419921

DRAGON 32

OASIS SOFTWARE



DRAGON CHESS £9.95

- ★ Six levels of play.
- ★ All legal chess moves including en-passant, castelling and pawn to queen promotion.
- ★ List of previous moves stored which can be displayed or printed.
- ★ Loading and saving of games positions from tape.
- ★ High resolution graphics which can be flipped round to make black or white play from either end.
- ★ Simultaneous text and graphics.

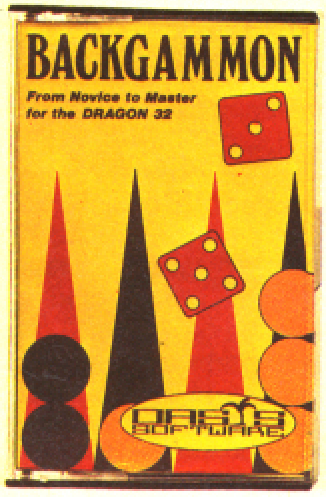
"Dragonchess is without doubt the best value chess on the market today . . ." (Microdeal)

Dragonchess is available from Boots and all good software stores.

- ★ Slides can be exchanged at any stage.
- ★ Best move hint.
- ★ Set up from any position.
- ★ Opening move library.
- ★ Moves may be taken back and play resumed from any point
- ★ Change level of play at any point in the game.
- ★ Will adjudicate games between humans.
- ★ Very high standard of play.
- ★ Professional packaging and life-time guarantee.

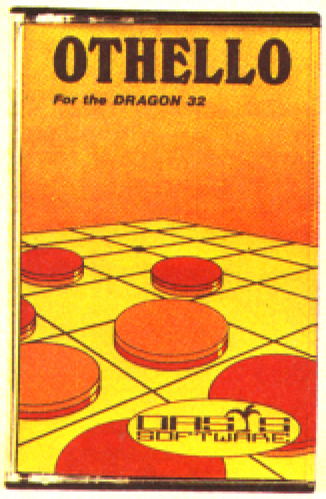
". . . I thought this was an excellent version of the game. Well worth buying . . ."
(Home Computer Weekly)

BACKGAMMON £5.95



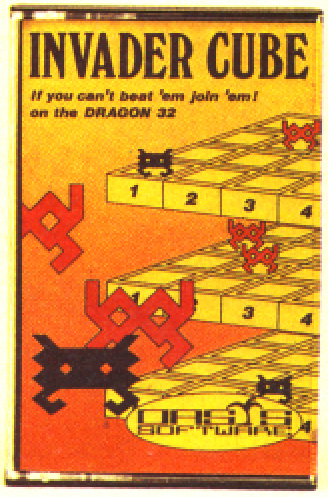
The well known game of backgammon complete with full instructions and computer demonstration for beginners.

OTHELLO £5.95



At last. Othello or Reversi as it's sometimes known running on your Dragon 32. 2 levels of play, full instructions and computer demonstration for beginners.

INVADER CUBE £5.95



As well as being one of the best games of skill written for the Dragon 32 it also has some of the best pure machine code graphics we have ever seen.

DOMINOES £5.95



Two games in one with full instructions. Hours of frustrating fun this program has 6 levels of play and on the higher levels adapts it's play to its assessment of your ability.

Mind Games Compendium —
All five games for just £19.95

ALL OASIS PRICES INCLUDE VAT AND P&P AND EVERY OASIS PRODUCT IS PROMPTLY DESPATCHED AND INCLUDES A LIFETIME GUARANTEE.

If your local dealer does not stock these products then let us know his address and we will contact him.

ACCESS ORDERS TAKEN BY PHONE 24 HOURS A DAY — 0934 419921

Access

OASIS SOFTWARE–
Intelligence in code.

OASIS SOFTWARE
ALEXANDRA PARADE
WESTON-SUPER-MARE
AVON BS23 1QT
TEL 0934 419921

Please send me

DRAGON CHESS	£9.95	☐
BACKGAMMON	£5.95	☐
OTHELLO	£5.95	☐
DOMINOES	£5.95	☐
INVADER CUBE	£5.95	☐
MIND GAMES COMPENDIUM	£19.95	☐

I enclose cheque/PO for £

NAME ....

ADDRESS ....

High level operating for all Dragon users

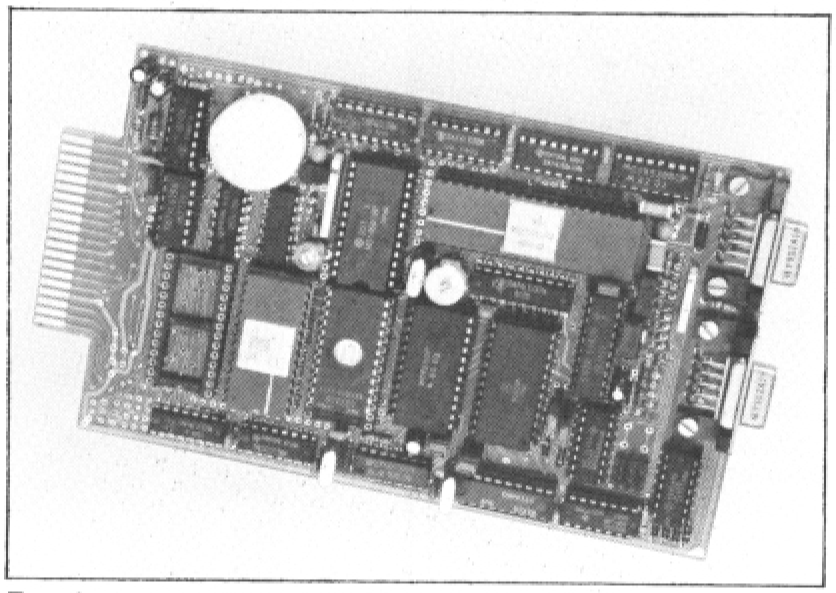
RUNNING A high level operating system on your Dragon 32 is now a possibility using a new component card from Andtek Data Systems.

Flex is the system which the card supports for 32 and 64 users — but it also supports two other systems on the 64, OS-9 from Dragon Data and Mumps which is available from Thoth Data.

Basically these disk operating systems, sometimes known as environments, manage the running of your Dragon and its peripherals.

Andtek's Jim Anderson points out that adding the card and whichever operating system is preferred will turn your Dragon from a home computer into a "professional low-cost disk-based computer system". A Tandy Colour TRS 80 32K or 64K can be similarly transformed.

In addition to the operating systems, the card supports four output devices: a standard 32 by 16 screen, an 80 by 24 column screen via serial port 0, a local hi-res character screen, and a modem via serial port 1.



Transform your Dragon with Andtek's component card

Four input devices are also supported: local computer keyboard, external keyboard via serial port 0, and a modem via serial port 1, with the fourth undefined.

Hardware features include two serial ports with bidirectional handshake lines, software programmable baud rate generator and a real time clock.

One other hardware feature should be of particular interest to 32 users: the 8K of RAM which allows Flex to be run on the Dragon 32. When used on the 64 it allows map 0 page switching.

Jim's opinion of the three operating systems supported is that OS-9 "should be quite big, particularly as software written on it can be moved up to 68000-based machines".

Flex "is more general purpose with a tremendous amount of software available". It is on sale in this country for about £130 including editor and macro-assembler.

Mumps is "more new to the micro world but has got to be looked at seriously, particularly for text applications." Thoth Data is at 11 Newarke Street, Leicester.

The card was developed for use by the 6809 Micro Group, chaired by Jim himself. When he realised the card's market potential he decided to make it available on a commercial basis.

Jim sees demand for the card coming from commercial users, software houses and "top-end enthusiasts who want to use Flex in its true environment without buying a more expensive machine".

Prices range from about £130 to £210 depending on configuration. The fullest configuration includes an extra 96K of user program on top of the Dragon's internal memory.

For further details contact Andtek Data Design, 41 Pebworth Road, Harrow, HA1 3UD — or call 01-422 4724.

An inside view of the insides

NOT CONTENT with helping to develop the Dragons 32, 64 and under-wraps "128", Dragon Data's technical software manager has put his hand to book writing.

The book in question is *Inside the Dragon,* written by Duncan Smeed and Ian Sommerville, and published by Addison-Wesley at £7.95.

Duncan is the Dragon Data manager while Ian is a lecturer on computer science at Strathclyde University, where Duncan too was a lecturer before joining Dragon Data last July.

Inside the Dragon is aimed at users who have got past the beginner's stage. "No one who wants to do more with their Dragon then play games can afford to be without it," explain the publishers.

Duncan adds that "the book contains virtually everything I know about the insides of the Dragon" — and he was design consultant on the software side for the Dragons 32 and 64. At the moment he's working on the system software for the "128".

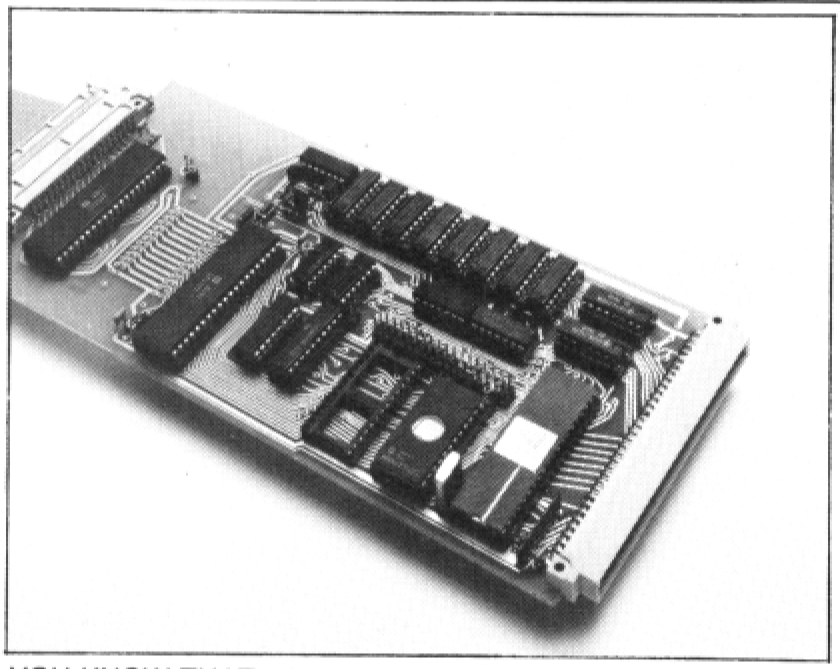
Technical subjects covered in the book include input/output hardware and software, graphics hardware, and Dragon Data's own disk operating system.

The book also contains details of the 6809 chip on which the Dragon is based — its architecture and programming instructions.

Data sheets are also included for this chip, along with the SN74LS783 multiplexor, the 6847 video display generator and the 6821 peripheral interface adapter.



THE RESEMBLANCE to Roger Moore isn't stunning but the costume does come from the James Bond film "Moonraker". The rig forms part of the promotional tour run earlier this year by Microdeal to promote its Space Shuttle game. The company also ran a competition in conjunction with the tour offering £1,000 worth of its software as prizes. Twenty different towns in the south of England were visited – from Ashford in Kent to St Austell in Cornwall, Microdeal's home town. Winners are being chosen from each area, with each standing to win £50 worth of games software from the company.



YOU KNOW THAT other micro which is always being showered with praise, the BBC B. Well Cambridge Microprocessor Systems has thought of a way to make it even better – by adding on a 6809 processor, the chip at the heart of the Dragon. Cambridge's single board 6809 processor card costs about £250. Another £130 allows BBC owners to keep in step with Dragon users – it allows them to run disk software under the Flex operating system. Phil Taylor explained that the 6809 is a "really super processor which, with its 16-bit internal structure, is much better than the BBC's 6502". Cut-down versions of the board can also be used as controller cards for the Dragon. Cambridge Microprocessor Systems is based at 11 St Margarets Road, Girton, Cambridge – or telephone (0223) 276791.

OS-9 system hits the streets

BY THE time you read this the OS-9 operating system from Dragon Data should have arrived in the shops.

Dragon Data expects the operating system, plus Basic 09 and three main business packages, to go on sale towards the beginning of February.

Other languages such as Pascal and C are expected to follow at the end of February — along with the editor/assembler/debugger.

The first three business packages are Stylograph for word processing at about £80; Dynacalc, a spreadsheet package at £60; and the Record Management System database at £55.

Other business packages are on the way, covering such items as Cash and VAT.

OS-9 itself costs about £40 — plus a £20 reference manual. The editor/assembler is £50. This compares with about £130 for a similar combination in Flex, the other main high level operating system for 6809-based machines.

Dragon Data points out that: "OS-9 enables advanced application software to be easily run on a Dragon 64.

"The more advanced the operating system is, the more advanced will be the software that is written to run under it. OS-9 is very advanced."

The UK agent for the American-written system is Vivaway which describes OS-9 as a "multi-user, multitasking, real-time, Unix-like operating system".

This means that one person can run several programs — and more than one person can be using the computer at the same time.

Vivaway adds that OS-9 improves on Unix by using modularity and doing away with disk swapping.

"The operating system is made up of several discrete modules, which are automatically recognised by the operating system when it is run.

"This means that it is a relatively easy matter to adapt or expand the operating system by altering only selected modules or writing new ones."

Bumper bundle from Premier

A BUMPER bundle of program aids has arrived from Premier Microsystems.

If you want to enhance your Dragon, there's Toolkit; if you're interested in assembler language, there's Encoder 09; if you own drives, there's disk conversion packages; and if it's graphics you're after, there's a sprite board and Doodle-Master.

Toolkit adds utilities, Basic words and function keys to your Dragon. It costs £29.95 as a cartridge, £24.95 incorporated with Premier's Delta disk cartridge, or £26.95 if fitted to a Delta cartridge you already own.

Toolkit's screen editor is linked to the Dragon's line editor which has been enhanced with four new commands. The eight programmable keys can call each other and more than 60 words have been added to the Dragon's Basic.

The range of new commands includes ERROR HANDLING, VARIABLE GOTO/GOSUB, TRACE and SEARCH and REPLACE.

Twenty-five full colour low resolution graphics screens are also available with commands for writing to any of them or swapping and moving.

Further graphics aid comes from the sprite graphics board with 256 by 192 resolution, 16 colours, 768 programmable graphics characters and full upper and lower case display.

Each of 32 display "layers" can be moved without disturbing the others. As Premier explains this makes possible effects such as a walking man moving behind one object and then in front of the next.

The board costs £99.95 as a kit, and about £27.00 extra fully assembled.

The other graphics package, Doodle-Master, allows you to define up to eight shapes at a time on the four-colour hi-res screen. Up to 20 may be created if no Basic is resident. Shapes can be swapped and moved — once you're happy with the results they can be used in other programs.

Characters can be created in green, blue, red and yellow; the inverse cyan, magenta, orange and blue can also be displayed. Doodle-Master costs £17.95 on cartridge or £15.95 on Delta-compatible disk.

Owners of the Dragon Data disk system Dragondos need not feel disheartened. Premier is offering to convert their systems to Delta for £59.95.

Conversion the other way will also be possible with a utility disk able to reformat Delta software to run under Dragondos. This disk offers other utilities such as sector editing and reading CONFIG.

The last of the new releases is Encoder 09, an assembler/disassembler/monitor with symbolic assembler, standard mnemonics and pseudo opcodes. It uses Basic for its editor so that line editing is always available immediately.

Encoder costs £39.95 as a stand-alone cartridge or £34.95 incorporated with a Delta cartridge. But you'll have to choose between Encoder and Toolkit as there's only enough space in the Delta cartridge for one or the other — or you could move up to a motherboard.

Encoder costs slightly more, £37.95, if you want it fitted to a Delta cartridge you already own. For details of this service call Premier on 01-659 7131.

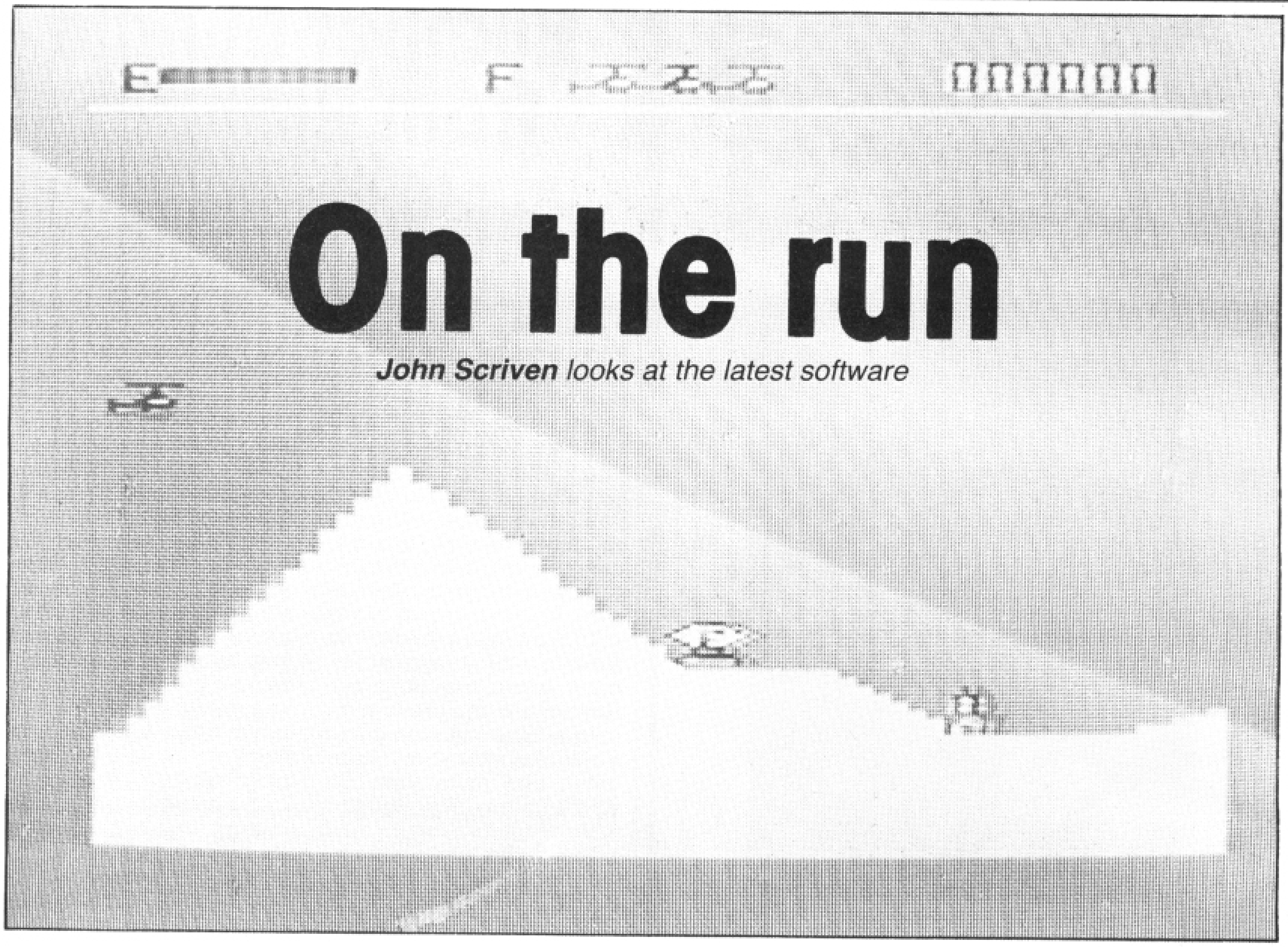
Electric aids

ELECTRICAL engineer Peter Williams has designed various industrial packages extending the Dragon's range of serious applications.

Peter argues that "rather than renting time on larger mainframes, electrical companies could save money by buying a micro such as the Dragon".

The packages he is offering cover power system fault level, short circuit cable sizing and cable scheduling — at £35.00, £5.00 and £20.00 respectively. He points out that the prices are low for industrial software. A trace heating program is next in line and others will follow.

For further details write to Peter at 10 Osprey Close, Guisborough, Cleveland.



On the run

***John Scriven** looks at the latest software*

IN GREEK mythology there is the story of one Sisyphus, who was condemned to push a stone up a steep hill. When he reached the top, it would roll down the slope until it rested once more at the bottom. At this point, the luckless Sisyphus had to begin his task all over again. This story came to mind several times while looking at the software this month. I thought of it as I waited for the umpteenth cassette to load, and again as I battled with the next band of aliens that came my way. In my more jaundiced moments I felt glad that I hadn't paid out my hard-earned savings to see the game in question.

If there has been a recent trend in home computer programs, it seems to be that the software matches up even less to the steadily more imaginative (and imaginary) artwork on the packaging that it arrives in. Before you think that I am still suffering from an excess of Christmas pud, rest assured dear reader. The truly bad programs aren't even mentioned this month, and hiding in the pile are some that are models for the rest to follow.

First, the arcade action games. Whirlybird Run, from Dragon Data, involves piloting a helicopter over mountainous terrain, while destroying enemy rockets and bases with guns and bombs. As the game progresses, you enter a cavern that scrolls across the screen as you meet more dangerous opponents while avoiding running out of fuel. If this sounds familiar to you, it should do, as this is simply a rather good version of the arcade favourite Scramble. The number of machines left, and the amount of fuel remaining, are shown at the top of the screen. One point always strikes me about this game — I can never grasp the logic that fills up your fuel tanks each time you bomb a fuel dump on the ground! In spite of this, and the fact that you seem to have a limitless ▶

Under review

Dragon Data
Kenfig Industrial Estate
Margam
Port Talbot
W Glam
Whirlybird Run
£12.95

Romik Software
272 Argyll Ave
Slough
Berks
White Crystal
Convoy Attack
Cyclops
Strategic Command
Romik Cube
£9.99 each

Virgin Games
61 Portobello Rd
London W11
UXB
£6.95

Dungeon Software
Milton House
St John St
Ashbourne
Derbyshire
Treasure Tombe
£7.95
Giant's Castle
£5.95

J Morrison Micros
2 Glensdale St
Leeds
Crusader
Maurice Minor
£6.95 each

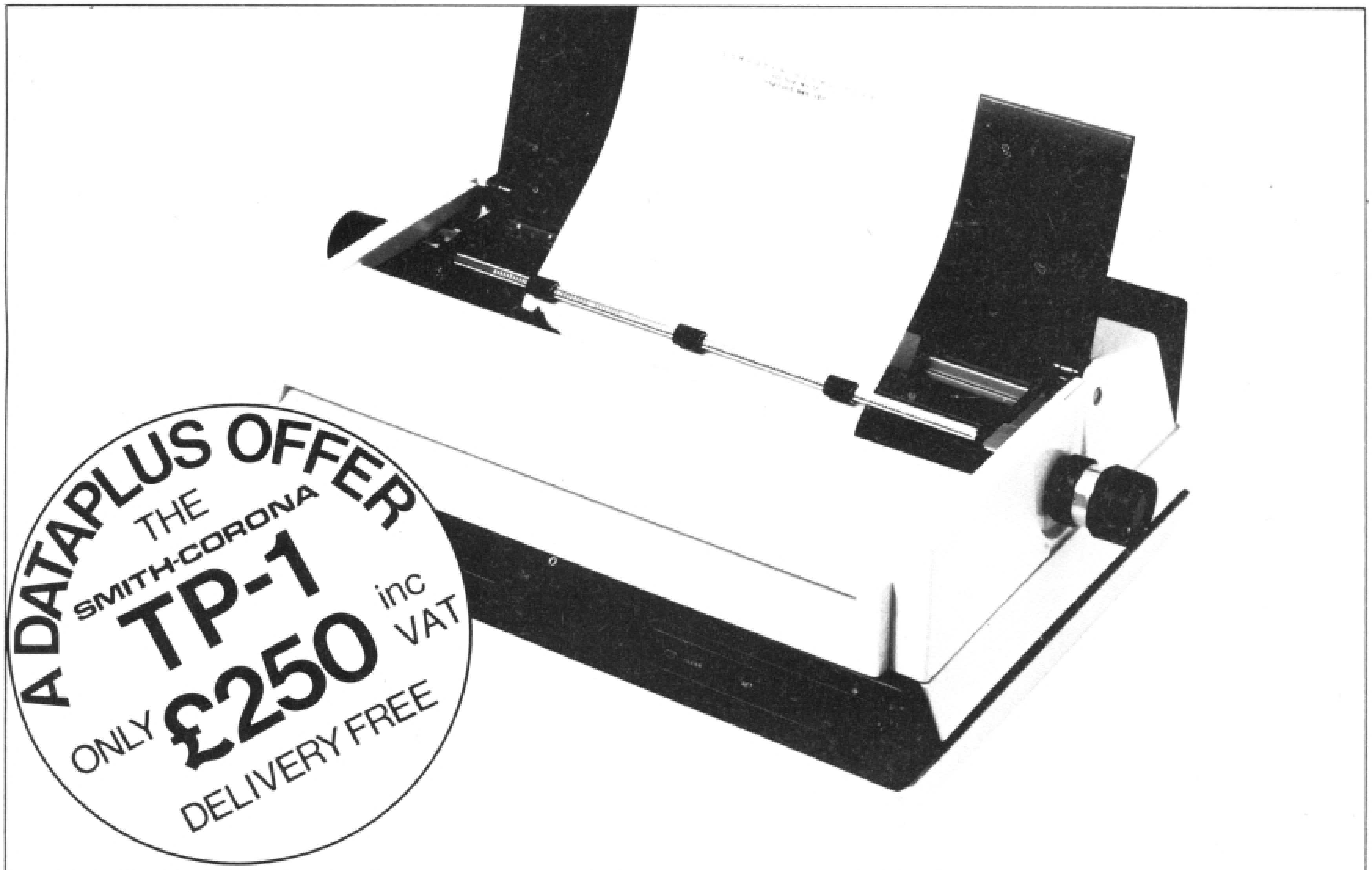
Phoenix Software
Spangles House
116 Marsh Rd
Pinner
Middx
Death Mines of Sirus
£9.95

Temptation Software
17 Norfolk Rd
Software
27 Cinque Ports St
Rye
Sussex
Searchword
Micropoly

Beyond
Competition House
Farndon Rd
Market Harborough
Leicestershire
Up Periscope
£6.95

Shards Software
189 Eton Rd
Ilford
Essex
Empire
£6.95
Pettigrew's Diary
£7.95

Salamander Software
17 Norfolk Rd
Brighton
E Sussex
Lost in Space
£9.95



'Dataplus have made their name supplying computer peripherals at competitive prices. I believe that we have now found the best price/performance daisy wheel alternative to dot matrix. The ideal printer for both data and word processing. Truely, a high quality machine at an affordable price. As Managing Director, I guarantee you won't buy better.'

So whatever your computer — BBC, Spectrum,*Commodore*, Dragon, Oric, Apple and many others — make the most of it and turn your computer into a quality printing system for home correspondence, documents, short stories and business use.

Use standard stationery or, for ONLY £79 (if ordered with your TP1) we will supply a tractor feed so you can use continuous or fanfold paper.

This is just one offer you can't miss. To avoid disappointment RING NOW on our 24 hour answering service 0242 527412 to place your order quoting your Access/Barclaycard No., expiry date and full name and address OR complete the coupon below and POST TODAY.

Please allow 28 days delivery. If not completely satisfied return goods in original packing within 10 days of receipt and we will replace or refund your money in full.

For technical queries telephone our Expert Hotline 0242 37373 or visit our showroom at 39-49 Roman Road, Cheltenham.

DATAPLUS

*CBM 64 & Spectrum Computers require a special interface cable kit. For assistance & price phone our Technical Hotline.

SPECIFICATIONS
Print Speed: 120 wpm
Character set 128 ASCII 88 printable
Character spacing: 12 CPI
Printing: Unidirectional
Paper width: 13" max.
Writing line: 10.5" 126 character line
Line spacing: 6 lines per inch
Paper Feed: Friction, single sheet or fanfold.
240 volts, 50Hz
Dimensions: (H) 6.4" (W) 19.5" (D) 12.4"
Weight: 18.5 lbs

Operator Controls: Power on/off, top of form, impression controls (5 levels)

INTERFACES
Parallel
Centronics compatible, 7 bit parallel data, 3 control lines (data, strobe, busy, acknowledge)
Serial
RS232C compatible, 50-19200 BPS, parity and character bit length all switch selectable.

Dataplus-PSI Ltd 39-49 Roman Road Cheltenham GL51 8QQ. Reg. No. 1715271 England. Offer open to UK only while stocks last.

To DATAPLUS-PSI Ltd 39-49 Roman Road Cheltenham GL51 8QQ
Please send me:—

Qty	Description	Price	Total
	TP1(s) with RS232 interface	£250	
	TP1 with centronic interface	£250	
	Interface cables serial/parallel*	£15	
	Tractor Feed	£79	
*Delete as applicable		Total	

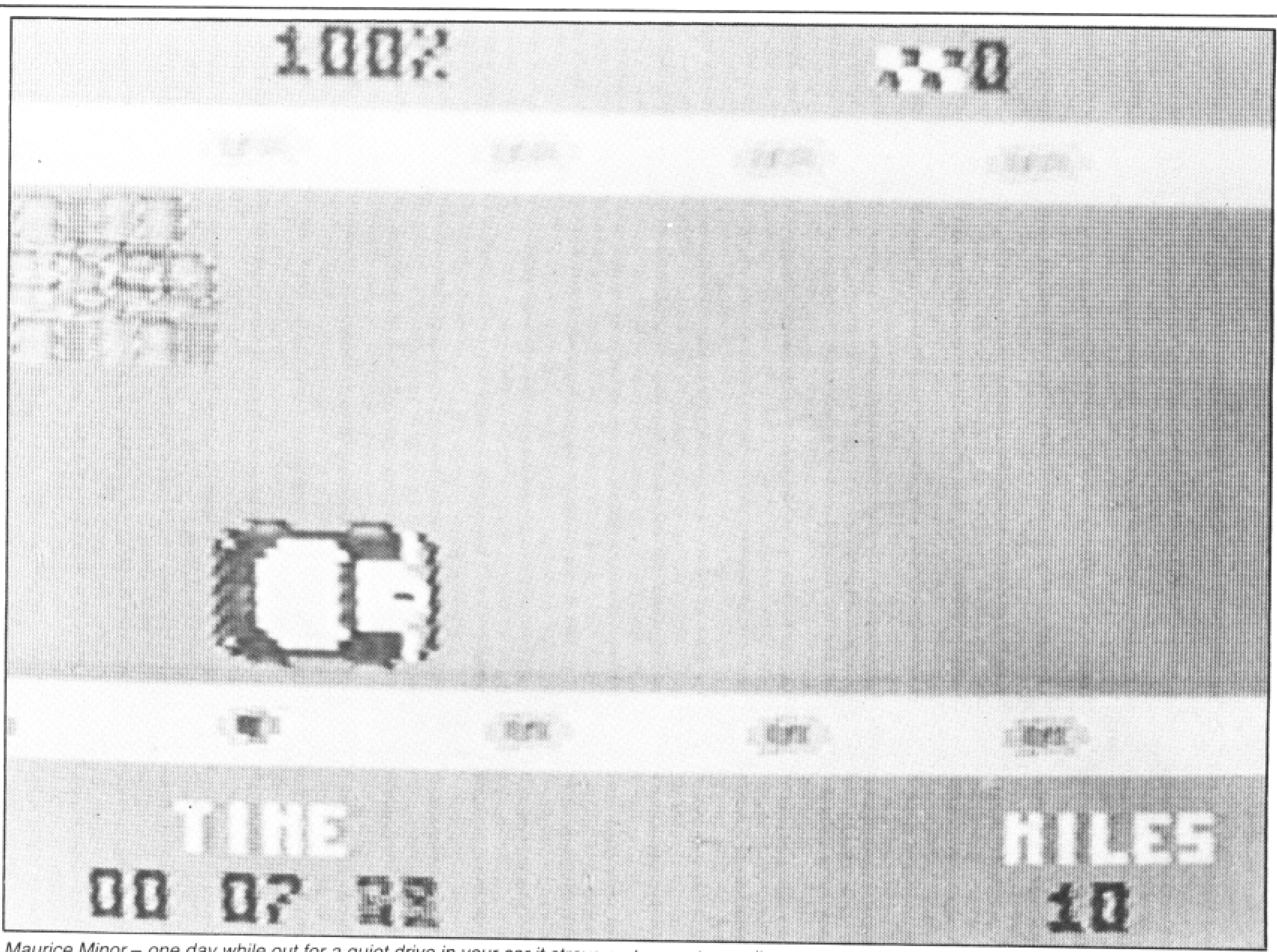
I enclose my cheque for £ ________ crossed and made payable to DATAPLUS-PSI Ltd or charge my Access/Barclaycard* Account No.

Expiry date of card ________

Signature ....

Name ....
Address ....
....
Postcode ....
Telephone No: ....
Make/Model of my computer ....
....

DU1



Maurice Minor – one day while out for a quiet drive in your car it strays on to a motor-cycling circuit in the middle of a race

◀ supply of ammunition, the game is fun to play.

A more serious criticism is that it is priced at £12.95, which is rather excessive. Perhaps in an attempt to justify this price, Dragon Data has produced the worst example of over-packaging I have yet seen. The single cassette is contained in a full-sized video-cassette box, more than nine inches by seven inches in size, and over one and a half inches thick. The instruction booklet is A5 in size, yet the text could be fitted on one page. Firms like J Morrison Micros, Premier and Salamander use a mini cassette case which is fine, but Dragon Data has made a mistake in using packaging that is so wasteful.

Intelligent

Romik has been producing Dragon software almost since the birth of the machine, and its game, Strategic Command, is a good example of using the computer as a display area for decisions made by two human players. Their recent titles show a move towards more machine-intelligent games. Convoy Attack is written by the same author, and consists of two parts. Part one entails guarding a convoy that appears as small blips at the bottom of the screen. Enemy missiles fly steadily towards your convoy, and can be destroyed by launching three planes from your aircraft-carrier and steering them into the path of the missiles. If your carrier is still intact at the end of the first wave, the screen shows in high-resolution a dogfight between you and the enemy. Romik sets a good example by putting an actual screen-shot of each program on the cover of its cassettes, and you are not tempted by false promises.

Romik also produces a real-time graphics adventure game called White Crystal. This consists of a complex cave system — you enter at the bottom — linked by a series of ladders. In the cave are chests of gold, food and the white crystal itself, which must be struck by your sword. You control a small figure using the cursor control keys, and the program shows that games do not always have to be written in machine code to be worthwhile. One small niggle is that the program does not disable the other keys, and "break" is rather close to the controls for comfort.

Another graphic adventure game written in Basic is Treasure Tombe from Dungeon Software. Apparently, there is a vast dungeon complex beneath Glastonbury Tor, containing Arthur's treasure. Set in Norman times, you can explore the labyrinth discovering the hidden wealth, while avoiding Merlin and his evil servants. Although this is not in the same league as fast-moving machine code games and only uses the lowest resolution display mode with symbols to represent the objects, the game is entertaining and interesting to play.

Another adventure-type program from Dungeon Software is Giant's Castle, a program designed for younger users. The object is to rescue a fair damsel from the giant's castle. In order to achieve this end, you must gain points by answering general knowledge questions. As the program is written in Basic, these are easy to change according to your requirements. The program uses a variety of tunes and drawings to enliven the proceedings but possesses some irritating features. The worst one is that occasionally you may be presented with a set of boxes. Choose the incorrect one and the program does not simply deposit you at the start again, it NEWs itself and you have to reload the program if you wish to play again. Hardly the best thing in a program designed for children.

Intrepid

J Morrison Micros has an original game in Crusader, another graphic adventure game that employs good use of graphics. Using the joystick, you control an intrepid knight as he charges up flights of stairs and along castle walls that scroll along behind him. Littering his path are scorpions, enchanted lakes and mysterious dwarves. Each life you lose speeds upwards to heaven. Having jumped over the scorpions and swung across chasms, the sleeve notes assure me that I shall reach the inner sanctum and that the Holy Grail will be within my grasp. I have to take their word for it, as I have yet to get past the dwarves. This game is to be highly ▶

◀ commended, and is similar in concept to Cuthbert in the Jungle.

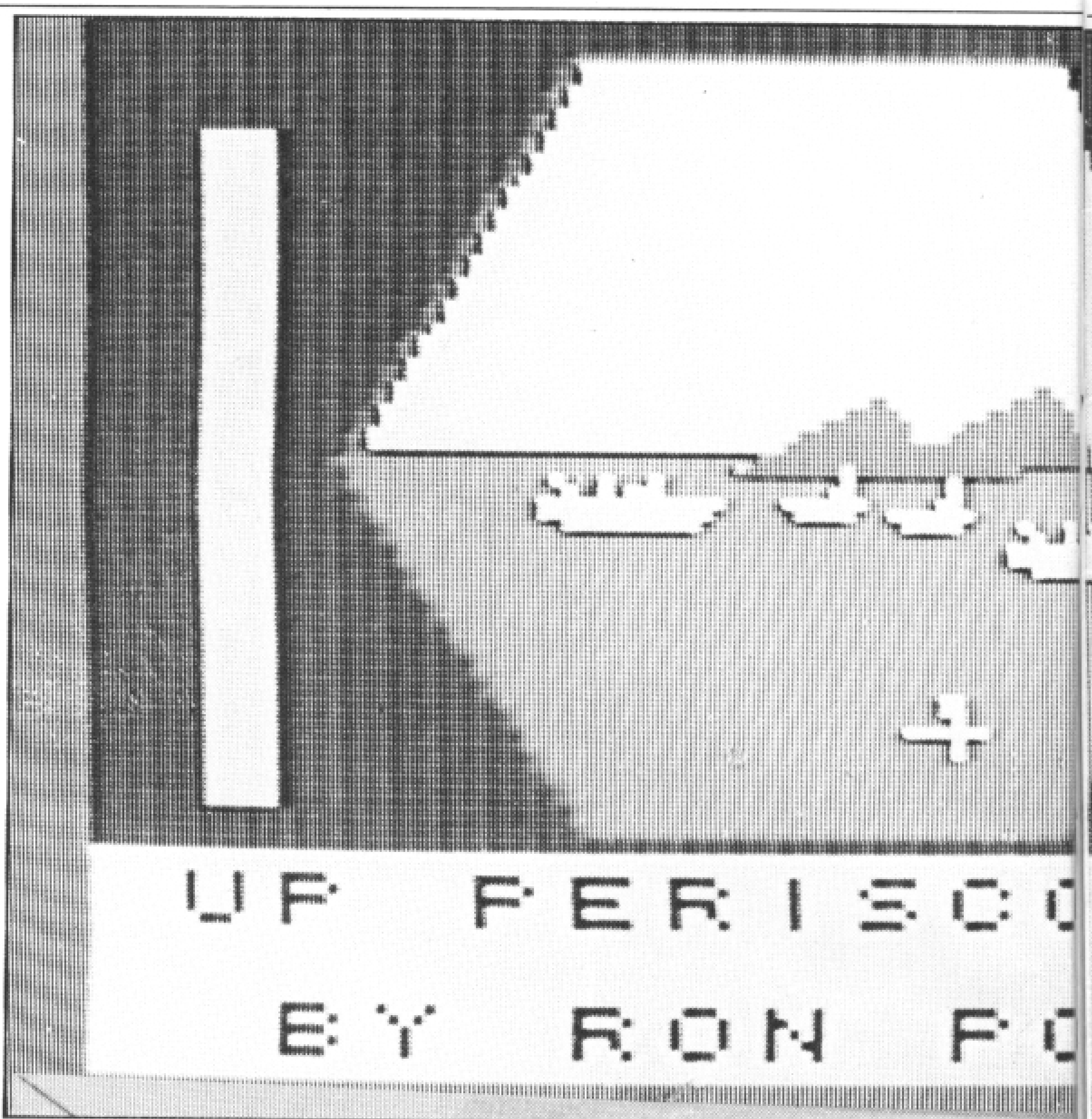
Having once seen the amazing graphics on the Atari motor-racing games, those written for other micros tend to come off second best. The displays are not up to showing the view from the driver's position, and usually rely on the screen scrolling downwards or to the left. Maurice Minor, also from J Morrison Micros, uses the latter method. The story is that one day, while out for a quiet drive in your car, it strays on to a Grand Prix motor-racing circuit in the middle of a race. The joystick changes your direction, but you are constantly wandering to the left or right, and oil patches appear under your wheels. This would be difficult enough if you were on your own on the track, but cars are constantly rushing past you unless you can accelerate using the fire button and stay out of trouble. You can enter your level of driving expertise at the start (Grannie is a good level at which to begin), and the road is yours. If you collide with the barrier or another car, a bit falls off your "Maurice Minor". The object is to complete 10 miles in the shortest time while still retaining enough of your car to get you round. Again, this is hardly reaching the frontiers of arcade action, but it's good as Dragon car race games go.

Energy

Cyclops from Romik is loosely based on Pac-man, in that in involves chasing round a maze eating energy nodules. It differs in that you can choose many different combinations of conditions, such as how many cyclops are after you, whether they are intelligent or not and how fast they move. Hidden in the maze are black holes that can send you spinning into another maze, more complex than the one you're in. If you don't have a version of Pac-man, this game can be recommended as it gives so many varieties and is less likely to become boring.

UXB was the wartime expression for an unexploded bomb, and Virgin has used it as the title of one of its programs. The aim is to defuse the bomb of the title, using only six items from a special toolkit. The program is menu-driven, and you can choose to view different sections of the bomb, or to attempt to defuse it. Although original in concept, there seemed to be only one correct path, and it was irritating being constantly blown into little pieces. I also managed to crash the program twice unintentionally. The inputs are not mug-trapped, and this spoils an attempt to produce an original game.

A game that attempts to bridge the divide between arcade and adventure programs is Death Mines of Sirus from Phoenix Software. The packaging is fairly large, but does contain two cassettes and instructions. As the program started and I entered Y for more instructions, I had to check the loudspeaker on my TV — the quality of the music was the best I had heard from my Dragon. Then I realised that the speaker was reproducing recorded music on the tape. Strains of *Zarathustra* filled the air, as a voice told me of the rescue mission I had to lead.



Up Periscope – involves moving a convoy of merchant vessels over the sea

If you can cope with the rather pretentious beginning, the first cassette contains a lunar landing type game, in which you have to pilot a drone to the surface of Sirus and pick up some miners waiting there. As you complete this stage, you are given a code to use in the second part of the adventure. I am led to believe that this consists of a text-only adventure, but as I failed to be given the necessary code in the arcade section, I could not start this part (hangs head in shame!). If you are not too good at arcade action, you could end up very irritated with this game. If this should happen, invite a friend with lightning fingers round and discover the code this way.

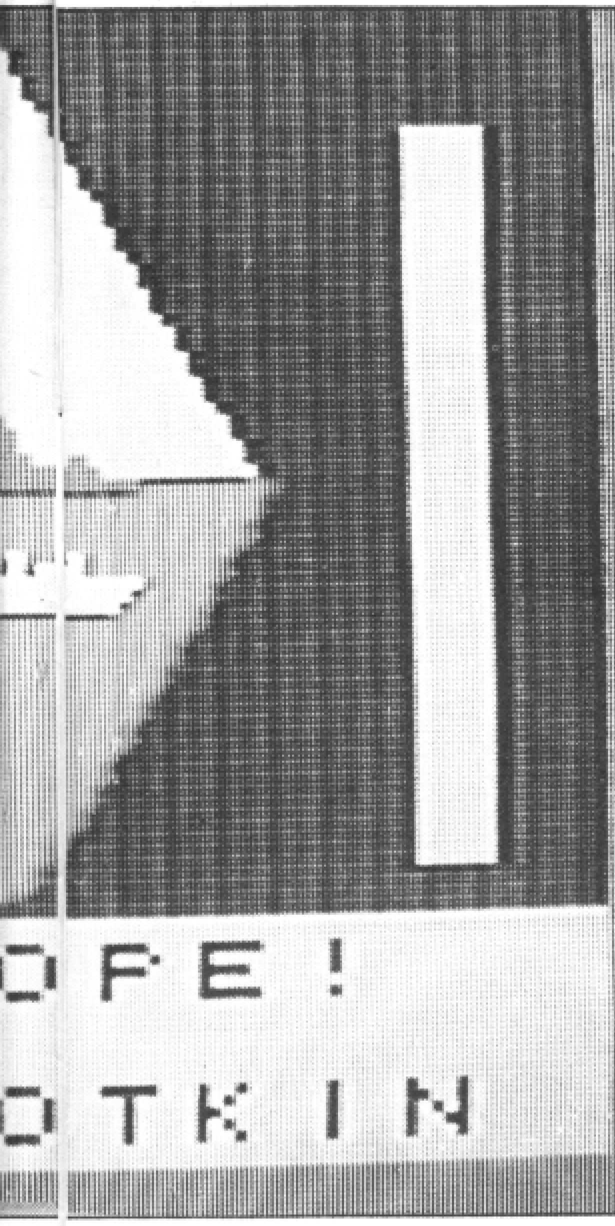
A supplier that appears new to me is Temptation Software. The two programs I have seen this month, one game-utility, and the other a version of a board game, are both packaged in an eye-catching box covered in "laser-cut" circles.

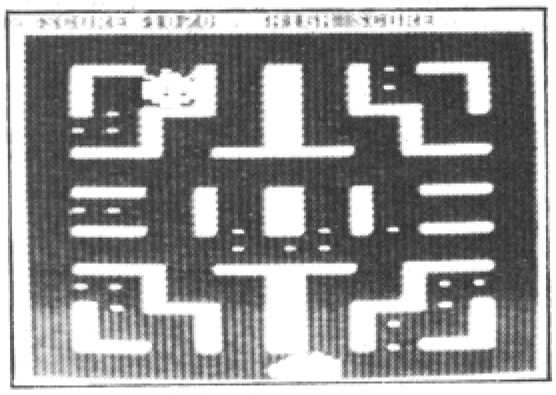
The utility, Searchword, is a game that can be played on the screen, or can be used to generate word-squares and print them on to paper. As it is menu-driven, the program is very simple to use. Words of up to 12 letters in length can be entered, and the program inserts them into a rectangle in one of eight compass directions. Words may be saved on cassette and entered at a later stage or the whole wordsquare may be copied to paper, if you have a printer attached. As a game, this program is quite good, but it really scores in educational areas. A set of spelling words, or those to do with a particular topic, could be entered by a parent or teacher, and the print-outs given to children to complete.

Micropoly from Temptation Software is a computer version of a certain well-known board trading-game known in some circles as "Go to Jail". Up to four players may participate. Some versions of this game merely use the screen as a display board, but Micropoly has the Dragon to play against you. All the options of the real game are present, including Chance and Community Chest. The displays are adequate, given the large playing surface of the board game, and the program is quite well written. If there are several of you, it's probably more fun to use the real game, but those closet capitalists out there may find this a way to trample on the poor in secret!

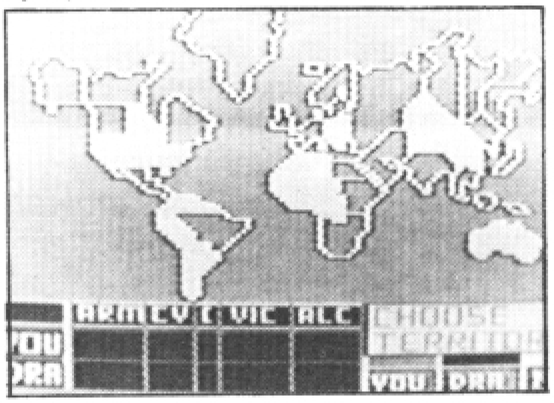
Another new name in the lists of software houses is that of Beyond. Its game, Up Periscope, is neatly packaged, containing cartoon graphics as well as an actual screen shot of the game in progress. This is unfortunately on the inside of the sleeve notes, so you won't be able to see it before you purchase it, but it's a step in the right direction.

The game itself can be played against the computer, or against another human, and involves moving a convoy of merchant vessels across an area of sea. There is a large island in the middle of the sea, which contains hunter-killer submarines as well

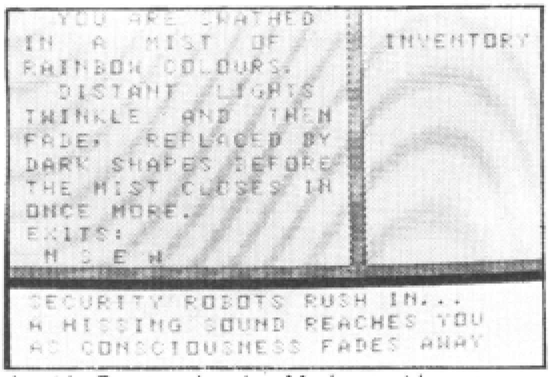




Cyclops – combinations of Pac-man



Empire – less messy than Napoleon



Lost in Space – leaving Marlowe at home

as a convoy protection fleet.

You can command either the protection fleet or the submarines in the two-player option, but you're limited to fleet commander if you play against the computer. There are two displays: the playing area, showing your vessels, but not those of your opponent; and a status report informing you of the state of play. You can never see all the sea at one time, so the cursor keys or the joystick are used to move the viewing screen over different sections. Each part of the screen is hexagonal in shape, so travel is limited to one of six directions.

Movement is achieved by centring a cursor over options shown on the bottom of the screen. These include straightforward moves, depth-charges, torpedoes and sonar. The instructions are clear, and the game easy to play. While not possessing the speed or graphics of some arcade games, it is a well-thought-out game of strategy that should while away those long winter evenings. (If you play against the computer, then it undoubtedly cheats by peeking at your position, but luckily, there is an option so you can do the same!)

Having blown away an ocean full of submarines, the megalomaniacs out there among you could do worse than move on to Empire from Shards Software.

At the start of the game, the world is shown as consisting of 39 blocks to be shared between you, the Dragon Empire and neutral countries. When you have allocated your forces round the globe, you and the Dragon take it in turns to invade other territories. The displays are very good, showing different continents or the whole world situation. The level can be selected at the beginning of the game from 1 to 8, and the top levels need a lot of concentration to prevent the Dragon Empire from over-running your land. If you fancy your chances as Napoleon, this is an ideal game to start with, and it's far less messy than the real thing.

After enjoying myself following the exploits of Dan Diamond in Franklin's Tomb, I looked forward to the sequel, Lost in Space. When it arrived last month, I was disappointed to see that Salamander has over-packaged this game, using a full-sized video case like Dragon Data. Luckily, the adventure game itself is entertaining, provided you have either a knowledge of Franklin's Tomb, a copy of *Hitch-hiker's Guide to the Galaxy,* a knowledge of British Rail food, and a warped sense of humour — or preferably all four.

The display is divided into three areas: a location description, an input section, and an inventory of objects collected. It seemed to take me a lot longer to get started than in Franklin's Tomb, and the frustration count is much higher, as security robots constantly rush in and you find you are "swathed in a mist of rainbow colours" for the 99th time. There are no graphics, but there is a 16-page accompanying booklet that has pictures of various locations. In some ways I feel that Dan Diamond isn't stretched to his full potential in this game. It's a pity that the Chandleresque dialogue in the booklet isn't repeated in the program itself.

The most ambitious program this month is an already established chart-seller — Pettigrew's Diary from Shards Software. This consists of a three-part adventure game, and clues gained in each section are essential to the following part. The first part takes place in a burning farmhouse which is shown as a high-resolution display. Your position is indicated by a small cross that can be moved about the screen with the cursor keys. As you explore, you discover a body, and several other suspicious things, but all the while, the flames are getting closer. If you manage to extract the vital clues and end up safely outside once more, the quest continues in London.

Eiffel

The second part of the game is a text-only adventure. One problem is that it is in real time, and a clock is ticking away at the top of the screen. Direction is controlled by entering compass directions, as in most games of this type, and it is a good idea to attempt to make a plan as you play or you soon become hopelessly lost.

The third and last part takes place all over Europe, and consists of various mini-puzzles, such as solving mazes and preventing your contact in Paris from flinging himself off the Eiffel Tower. There are limited graphics where they can usefully add something, and eventually you can use all the codewords gained in the game to bring it to a satisfactory conclusion. I'm not sure how successful this game really is, as it darts from one problem to another, and once you have solved it, there is nothing else left to do. However, this is a criticism that can be levelled at most adventure games, and this one certainly offers variety and reasonable value at £7.95.

In the dim and distant past — was it really just three years ago? — everyone walked round twiddling little coloured plastic cubes. Romik Software produces an activity — I would hate to call it a game — called Romik Cube. Apart from normal solving of the cube, termed the "practice" game, there are two highly advanced versions for those of you who find a standard Rubik cube too easy. The "time" game has a cube where the colours of the faces change every 80 seconds. If even this is too easy for you, then the "space" version allows you to manipulate a cube in four dimensions. I am impressed by the coding on this cassette, but wonder how many people will actually want programs of this complexity.

This month, I didn't find much that really inspired me — a few competent games, but few with a spark of novelty. The names and the packaging are different, but the games turn out the same.

And now, picture poor Sisyphus reaching the last cassette for his Dragon, and as he leans back in his chair to relax, he sees the postman arrive with yet another bag full of new versions of Invaders . . . ■

ELITE*CALC

Features include

- **255 MAXIMUM NO. OF ROWS**
- **255 MAXIMUM NO. OF COLUMNS**
- **VERY EASY TO USE**
- **INDIVIDUAL CELL FORMULAE**
- **COPY BLOCKS OF CELLS**
- **COMPATIBLE WITH ALL PRINTERS**
- **EASY 132 COLUMN PAGE WIDTH**
- **GRAPH FORMAT FOR BAR CHARTS**
- **COMPREHENSIVE MANUAL INCLUDED**
- **INTERNATIONAL USER GROUP**
- **SORT ROUTINE IN ASCENDING OR DESCENDING ORDER**

- Single character commands
- Help display
- Enter text or formulae to 255 characters long
- Repeat text entries
- Available memory always displayed
- Rapid entry modes for text and data
- Selectable automatic cursor movement
- Insert, Delete, Move entire rows or columns
- Replicate one cell to fill a row or column with selectable adjustment
- All machine language for blistering speed
- >24K data storage space available in 32K systems.
- Basic style formulae
- Arithmetic operators: −, −, x, /, , (,), =
- Relational operators: =, >, <, <=, >=, <>
- Logical operators: AND, OR, NOT
- Conditional formulae: IF. . . THEN . . . ELSE
- Trig. functions: SIN, COS, TAN, ATN
- Log. Functions: LOG, EXP, SQR
- Misc. functions: INT, FX, ABS, SGN
- Range functions: SUM, AVERAGE, COUNT, MIN, MAX, LOOKUP
- Nine digit precision
- User definable constant table
- User definable printer set-up commands
- Individual column width settings (1 to 255)
- Adjustable row height to insert blank lines without wasting memory
- Hide columns or rows
- Alternate print font selectable cell by cell
- Display/Print formats set by cell, row or column
- £-format, comma grouping, prefix or postfix signs
- Scientific notation, fixed point and integer formats
- Left or Right cell contents justification
- Full page formatting
- All formats stored with worksheet on disc/tape
- Save/load disc/tape files in compact memory form
- Scan disc directories
- Output ASCII file for word processor input compatability
- Memory resident code . . . no repeated disc calls

*NOW . . . The worksheet calculator program you've been waiting for is waiting to work for you. ELITE*CALC is a powerful, full featured spreadsheet for the Dragon 32/64 and Tandy Color Computer. Answer 'what if . . .' questions, prepare reports and cash flow projections, maintain records and perform other tasks which, until now, required sophisticated business computers. ELITE*CALC is a serious tool for those who want to do more than play games on their micro.*

Availible from stock on cartridge for the Dragon 32 or 64 or Tandy Color Computer . . . please specify. Shortly available on disc for the Dragon Data or Cumana/Premier or Radio Shack systems. Also available in the $–format instead of the £–format if requested.

THE BEST FOR ONLY £45

Elite*Calc has had excellent reviews in the American press and an enthusiastic reception at the recent International Rainbowfest.

*"Elite*Calc is a great spreadsheet program"*
Stuart Hawkinson, Rainbow

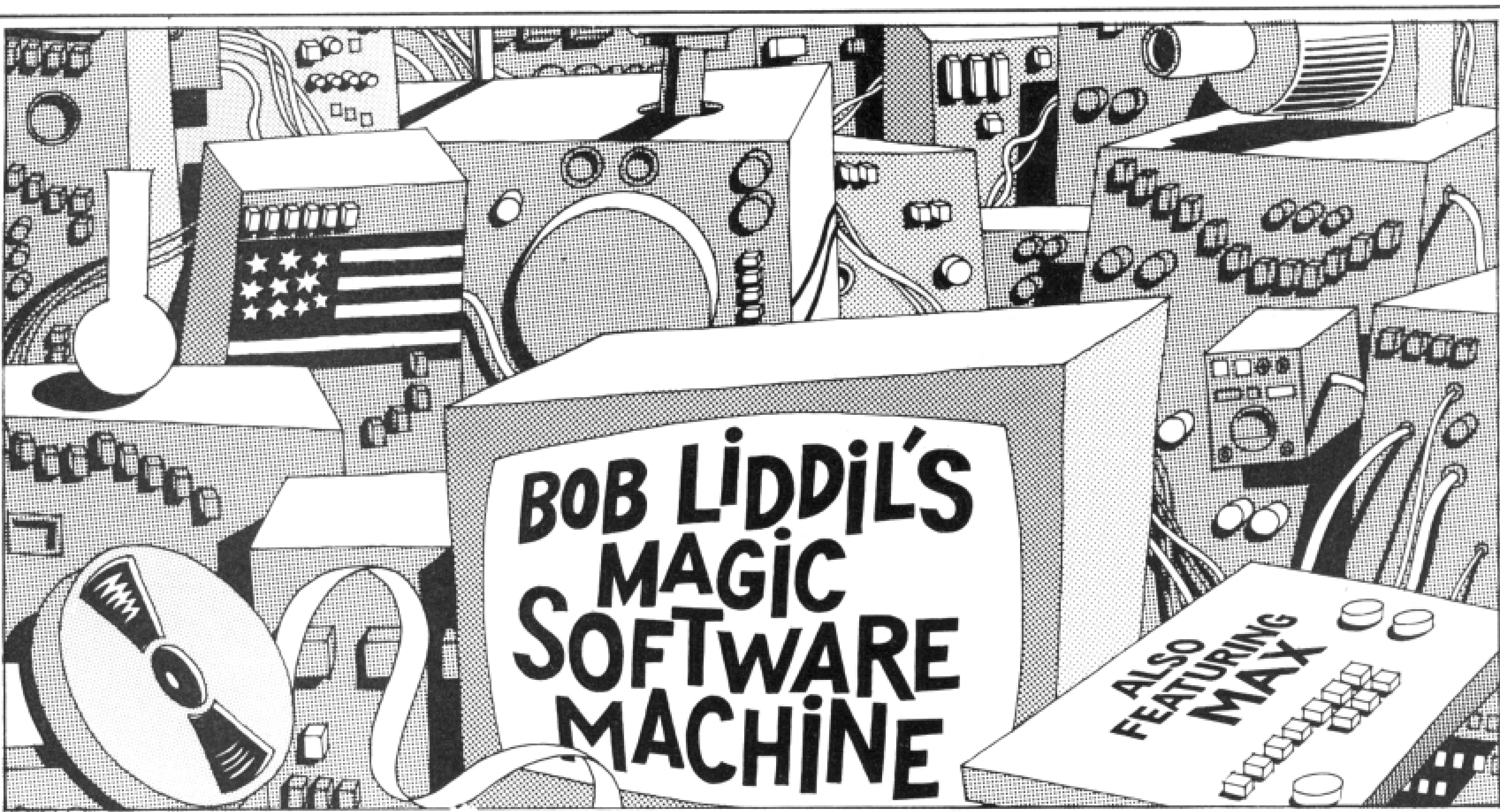
"Truly one of the best programs I have seen"
John Steiner, Micro

"Very powerful program . . . essential to every serious user"
Mike Jarvis, M & J Software

ENQUIRIES INVITED FROM RETAILERS AND DISTRIBUTORS (HOME AND OVERSEAS)

MICROCARE
1 OAKWOOD ROAD,
RODE HEATH,
STOKE-ON-TRENT
☎ (09363) 5695

DRAGON 32/64
TANDY COLOR COMPUTER



I USED TO be just an average software reviewer until I met Max. Max is a computer program, a sentient cyber being, wholly self-contained and currently residing in an EPROM pack connected by remote ribbon cables to the Dragon in the attic computer laboratory of my American house. How he came into my acquaintance is a strange, sometimes bizarre story.

The previous resident of the house was a certain Professor Megabyte — hardware engineer, tinkerer, and registered with the Genius Exchange as being on call for consultation Mondays to Thursdays. On those long weekends the professor toiled on his lifelong quest to solve the riddle of CSDS, Computer Software Dimensional Sideslip. In lay terms, he believed that the world of computer software existed parallel to our own and that with the proper interface he could enter that world. All three of his assistants believed that this was rubbish and were subsequently sacked. After that, Professor Megabyte toiled alone.

Max came into being as an ordinary program. His name stands for Multisynchronus Annexation Execution program. That actually spells MAE but I never ask personal questions (besides, have you ever priced a female voice chip for a speech processor?). His job was to act as a lifeline between Realworld and the particular Program Module Dimension being explored by the professor. Up until the first PMD probe Max was just another program, highly sophisticated, but a program nonetheless. Then fate stepped in, tripping on some loose cables lying about.

For years Professor Megabyte had been striving for this, the moment when he would actually fulfil his dream, to meet Captain James T Kirk aboard the USS Enterprise. All the planning, the tedium of calculation, and endless hours of missing his tea would pay off now. He pressed the PMD manual override button, was instantly de-rezzed and beamed aboard the starship of his dreams which was floating serenely on routine patrol in a nearby Tandy Colour Computer. Needless to say, a certain Vulcan's eyebrows lifted considerably and Captain James T Kirk was very startled indeed.

Meanwhile, Max was maintaining the link, waiting for the code to bring back the professor. He recalls little of those presentience years, but what happened next, he remembers vividly.

"I was monitoring all the equipment in the lab," Max explained to me once, "the PMD stabiliser was within tolerance, the secondary balance circuits were on standby, the teapot was just beginning to whistle, when I heard, through my audio input device, a terrible crashing sound." This was later identified as a local thunderstorm.

Seconds to act

"Suddenly, the power fluctuated wildly. I executed the emergency subroutine, to bring back the professor to Realworld. I knew that if he were caught in a RAM based dimension when the power failed he would disperse with the clearing of that memory and be lost forever."

Max's effort to reintegrate Professor Megabyte failed due to the loss of a miniature relay in the PMD stabiliser. Realising he had only seconds to act before the power went to zero, Max opened a phone line, activated the modem and transferred to a nearby public database, the Enterprise, the professor and some very surprised Romulans who'd been sneaking up on the federation starship from behind.

The power surged but failed, burning out several chips in Max's EPROM pack. The sudden elevation in voltage rearranged some primal binary codes in Max's programming resulting in a severed link for the professor and self-awareness for Max.

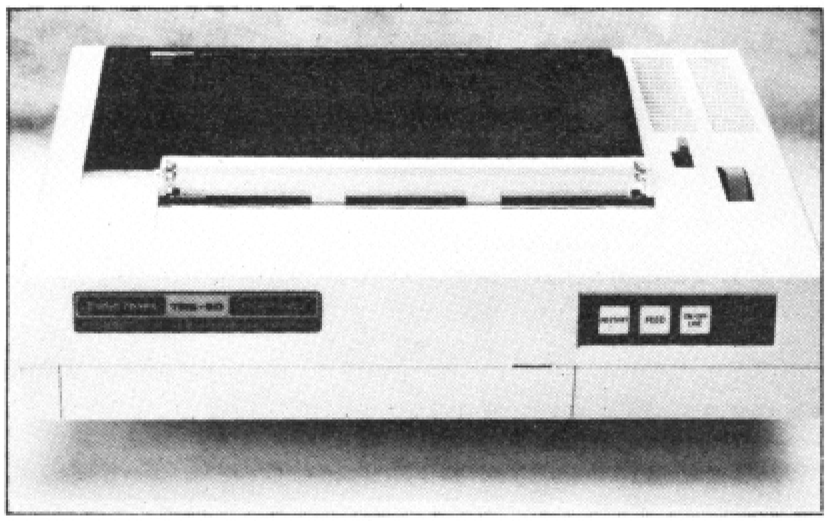
Several months passed as Max searched in vain for the lost professor. Finally he decided he had to have human help to bridge the gaps between himself and the residents of Realworld. So he offloaded himself into a phototypesetting computer and advertised for a tenant for the house. Me.

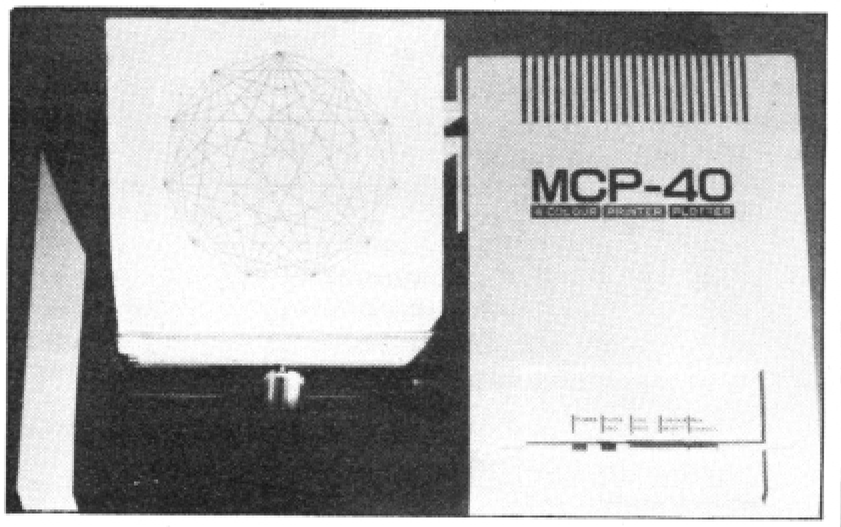
It didn't take a mental giant to figure out that, as a software reviewer, I would have it made. Max would supply me with an unlimited array of programs obtained from friends of his in the industry, both human and cyber. I, in return, would maintain the house in Realworld, buying him the time he needed to search through the endless corridors of software world for his lost professor. It was the perfect business deal.

By now, you may be wondering what all this has to do with *Dragon User* and Dragon users in the United Kingdom, Europe, Australia and New Guinea. Well, it is a known and accepted fact that American game software, whether purchased from local vendors in the UK or directly from the States, is a desirable commodity. This is not meant to low rate home-grown software which represents many mega-hours of effort on the part of UK Dragon users. Rather it means that Max and I intend to spotlight things that otherwise would get little or no attention in the Euro-community.

And what are *my* qualifications for explaining American software offerings to you? Simply put, I am sitting in the thick of it. I have first look at many items of American Tandy Colour software, even before the consumer. And many American producers are scrambling to make their products Dragon compatible.

So, for at least the next few months — while you, the Dragon users of the world, decide whether you like this column — Max and I will be bringing you news and reviews from America. Incidentally, Max says to remind you that if you run across Professor Megabyte in any of your Star Trek programs, would you please ask him to phone home? ■





Printing power

***Michael Watts** tries his hand at four and seven colour printing*

IN RECENT months we have been presented with an ever-growing range of colour printers and plotters from a variety of sources. Notable among the multitude must be the MCP-40 four-colour printer/plotter and the Tandy CGP-220 seven-colour ink-jet printer.

The MCP-40 printer/plotter from Japan, distributed here by Micro Peripherals, interfaces with any micro supporting a Centronics parallel port and offers comprehensive facilities for the production of program lists and text or graphics in any combination of the four available colours, red, blue, green or black.

Contained in a neat, wedge-shaped, mushroom and dark chocolate coloured plastic case this compact printer/plotter (28×17×6cm) arrives in a fairly well protected polystyrene and cardboard package complete with a single roll of four-inch-wide paper and a set of four of the unique, miniature ball point pens which are said to be capable of drawing up to 250 metres.

MCP

Built on the same mechanism as the Oric, Tandy, Sharp and CBM printer/plotters the MCP-40 (Micro Colour Printer, *not* Male Chauvinist Plotter as someone suggested) costs £129.95 including VAT. The MCP-40 seems to be quite robust, my only reservation being to do with the pen carrier which seems to suffer quite a hammering particularly when the plotter is used to turn out broken lines. In fairness the user manual does warn that the pen holder should only be moved using the printer control switches.

While on the subject of the manual I think it fair to say that this document is barely adequate. Undoubtedly it covers the various control codes which actually make the plotter work, albeit at times in a rather obscure way and with some obvious mistakes in the sample programs. Where is really falls down is in respect of interfacing the printer to the computer. According to the manual one simply plugs the appropriate cable (not supplied) into both the computer and the printer. As anyone who has spent hours trying to interface items of computer equipment already knows nothing in this world is that simple. I tried the MCP-40 out with a wide range of micros and in fact only ran into problems with my Osborne 1. However, they are all different and really the only solution is to make sure that your supplier sets everything up for you and explains how.

Three small switches on the top of the printer handle line feed, colour selection and pen change while indicator lights are provided for power on and paper out. Underneath the MCP-40 is a bank of four DIP switches which handle the selection of 40 or 80 characters per line (Dip 1). Carriage Return only or Carriage Return and Line Feed (Dip 2) and selection of JIS or ASCII characters (Dip 3). Dip 4 is unused.

A self-test mode is provided, when by holding the line feed switch down as power is applied the printer will churn out all 96 of its available ASCII characters set in four colours. Normally, at turn on, the printer performs a short self test by drawing four small boxes, one in each colour which, while slightly annoying at times, does at least ensure that the pens are warmed up and have ink available.

Using the MCP-40 with the Dragon 32 presented absolutely no problems, the standard Dragon-Centronics cable working first time. According to the manual, instructions are sent to the printer using the LPRINT command. However, in our case a simple substitution of the command PRINT= −2, (not forgetting the comma) works every time. A brief study of the program listing (*Fig 1*), taken from the user manual with suitable modifications, will give some idea of the way that commands are sent to the machine by way of the PRINT= −2, instruction. The output from the program in *Fig 1* is shown in *Fig 2* to illustrate the resolution possible.

Script is available in a range of sizes from 80 columns across the four-inch paper to one single column and it is easy to rotate the output from the printer through 90, 180 or 270 degrees making it possible, with some work, to produce large, multi-coloured letters lengthways on the paper.

According to the information supplied with the printer accuracy (on repetition) is better than 0.2mm, on movement better than 0.3mm, and on distance better than 0.5 percent (X-axis) and 1 percent (Y-axis). Plotting resolution is, in my view, more than adequate being in steps of 0.2mm with 480 steps in the X axis (across the four-inch paper) and no limit in the Y axis. I unfortunately have no way of checking these figures, deviation of this order being extremely hard to measure. However, a simple empirical test of drawing a line about half a metre long diagonally down the paper, returning to the beginning and repeating the process several times resulted in one single heavy line.

I found the Micro Colour Printer to be an extremely useful and versatile tool which while rather slow at about 12 characters per second is probably more than adequate for the home micro user wanting to produce occasional hard copy of programs. The ability to produce high quality, four-colour graphs, pie charts and so on must make it attractive to many, and the facility for producing four-colour screen dumps from the Dragon using a graphics dump routine like the one from Deltasoft must make it even more attractive.

At around £130.00 including VAT the MCP-40 is extremely good value for money. The pens cost about £3.00 per set and the paper about £1.00 per roll — making this four-colour printer/plotter a most attractive proposition.

Tandy

The Tandy TRS-80 CGP-220 Colour Ink Jet printer takes another novel approach to the problem of multi-colour printing by making use of an "on demand" ink jet system drawing tiny quantities of ink from its four reservoirs and applying them to the paper with a piezoelectric-type head.

Supplied in a solid cardboard box ▶



Games that come from...
BEYOND
CHALLENGING SOFTWARE
UP PERISCOPE
PROTECT the convoy using SONAR + Depth charges to seek out and destroy the enemy below!
Try and pick off your Enemy from below the waves!
Kriegspiel
...How much longer can we hold this town...?
Here comes the first flakes of snow and out of it – their Tanks!
KRIEGSPIEL: A thrilling game of strategy to be played against the Dragon or any other devious opponent.

DRAGON 32 OWNERS

Make your Dragon turn into a real computer with the new Double-Density Delta Disk System.

DELTA DISK SYSTEM

The Delta Disk System Gives You . . .

- An affordable disk system.
- Powerful Delta disk commands.
- Lets you produce and handle random access files as easily as serial files.
- Random sequential and indexed file handling.
- Simple plug into Dragon there are no HARDWARE MODS needed to run DELTA!
- Easily expandable 180K to 1.4 megabyte ON LINE storage.
- Full range of business utility and games software AVAILABLE NOW!
- The price you see is the price you pay. NO HIDDEN RAM upgrade costs.
- Uses under 2K of user – RAM as DELTA is held in EPROM.
- Enables programmer to easily produce applications Software which automatically starts up and operates without any intervention from the user.

DELTA CARTRIDGE – contains DELTA disk Operating System, User Manual, demonstration diskette	£120.00
DELTA 1 – DELTA Cartridge, User Manual, a single-sided 40-track (180K) drive plus cable	£320.00
DELTA 2 – as DELTA 1, but with a single-sided 80-track (360K) drive	£355.00
Disk Interface cable (supplied with DELTA 1 or 2)	£9.95
ENCODER 09 assembler/disassembler/editor – integral with DELTA	£24.95
HOME ACCOUNTS full home package for DELTA	£14.95
INFORM – Data Base Management System commissioned especially for DELTA Systems	£39.95

FULL RANGE OF BUSINESS SOFTWARE AVAILABLE. SEND SAE FOR DETAILS.

NEW

TOOLKIT FOR DRAGON 32

PREMIER'S ASTONISHING NEW TOOLKIT FOR THE DRAGON 32 PERFORMS THE FOLLOWING AMAZING FUNCTIONS:–

- FULL screen editor allowing copying, concatenating of lines etc. Fully linked to the DRAGON'S line editor.
- Eight PROGRAMMABLE KEYS – all easily accessed or checked.
- 25 full colour low-resolution graphics screens available with commands for instantly writing to any of them or swopping/moving. MAKES COLOUR ANIMATION AT MACHINE CODE SPEED a simple task.
- Full range of ERROR HANDLING commands with several RESUME options.
- OVER SIXTY NEW WORDS fully linked to your DRAGON BASIC – your new commands become built-in as soon as you plug in the TOOLKIT cartridge.
- VARIABLE GOTO/GOSUB commands, allowing routines to be called by name. Eg GOSUB TITLE or GOTO FINISH.
- Superb TRACE command which uses top right of screen only, thus leaving graphics/text intact.
- SEARCH and REPLACE commands for easier program modification.
- Comes complete with COMPREHENSIVE 40+ page MANUAL.

Available in CARTRIDGE or DELTA enhancement format £29.95inc.

NEW

● DRAGON Fig FORTH ON DISK FOR DELTA ● Executes up to 10 times faster than BASIC ● Language extendable by user defined words ● Words can even be defined using the FORTH assembler for maximum speed ● BASIC and DELTA commands still available from FORTH ● Source code stored and can be compiled from disk ● FORTH can be saved to disk, including any new definitions ONLY £29.95 including MANUAL + Fig FORTH glossary + Model. Inc. VAT

SCRIBE FOR THE DRAGON 32

- FULL UPPER and LOWER CASE direct from the keyboard.
- An enlarged 42 x 24 screen display which gives a superb READABLE text.
- Full text display on hi-res screen.
- Automatic underline and reverse image.
- Up to 255 user-defined graphics.
- Precision character position command giving super/subscripts.
- Black on white text display option.
- A new Print @ command extending to 1008 thus almost doubling screen area.
- Cartridge/Disk £17.95. Tape £14.95.

ENCODER 09 FOR THE DRAGON 32

ENCODER 09 – is a full symbolic assembler using standard mnemonics and pseudo op-codes. Source code can be incorporated into BASIC programs. The monitor section contains commands to allow memory display, modification and execution. Memory block move, breakpoint handling, full disassembly and a full editor are only a few of its many features. The most powerful assembler/disassembler/editor available for the DRAGON 32. Available as either an integral DELTA fitment or in cartridge.
Cartridge £29.95. Disk – see above.

HIPRINT FOR THE DRAGON 32

HIPRINT – screen dumper.

– will dump the entire contents of your DRAGON 32 high-res screen to a high resolution printer. Can be used for design, display etc. Available at for EPSON, MICROLINE and SHINWA printers. Other modules to follow shortly.
Tape £7.95. DELTA disk £9.95.

PREMIER MICROSYSTEMS

PREMIER MICROSYSTEMS
208 Croydon Road, Anerley, London SE20 7YX
Telephone 01-659 7131 or 778 1706
Dealer and export orders welcomed.

POSTAGE and PACKING
Tapes 1 – 2 95p, 3+ £1.25.
Cartridges £2.50
Drives or Disk packages £4.50
ALL PRICES INCLUDE VAT.
Send SAE for full catalogue.
ALLOW 28 DAYS FOR DELIVERY.

Access
BARCLAYCARD VISA

Figure 1

```
440 REM PLOTTING
450 PRINT#-2:PRINT#-2, "PLOTTING ABILITY
"
460 PRINT#-2,CHR$(18);"L0"
470 PRINT#-2,"M250,-180":PRINT#-2,"I"
480 FOR I=0 TO 350 STEP10
490 S=I/180*3.14159
500 X=SIN(S)*200.5:Y=COS(S)*200.5
510 X=INT(X):Y=INT(Y)
520 PRINT#-2,"D";X;",";Y:PRINT#-2,"H"
530 NEXTI
540 PRINT#-2,"M0,-450"
550 PRINT#-2,"I"
560 S=2*3.141592625/11
570 FORI=0 TO 10
580 A(I,1)=INT(SIN(I*S)*200.5)
590 A(I,2)=INT(COS(I*S)*200.5)
600 NEXTI
610 PRINT#-2,"M";A(0,1);",";A(0,2)
620 C=2
630 FOR I=0 TO 4
640 K=0
650 C=C+1:IFC>3 THEN C=0
660 PRINT#-2,"C";C
670 FOR J=0TO10
680 K=K+I+1
690 IFK>10 THEN K=K-11:GOTO 690
700 PRINT#-2,"D";A(K,1);",";A(K,2)
710 NEXTJ
720 NEXTI
730 PRINT #-2,"D";A(K,1);",";A(K,2)
740 PRINT#-2,"M0,-200":PRINT#-2,"C0"
750 PRINT#-2,CHR$(17)
760 END
```

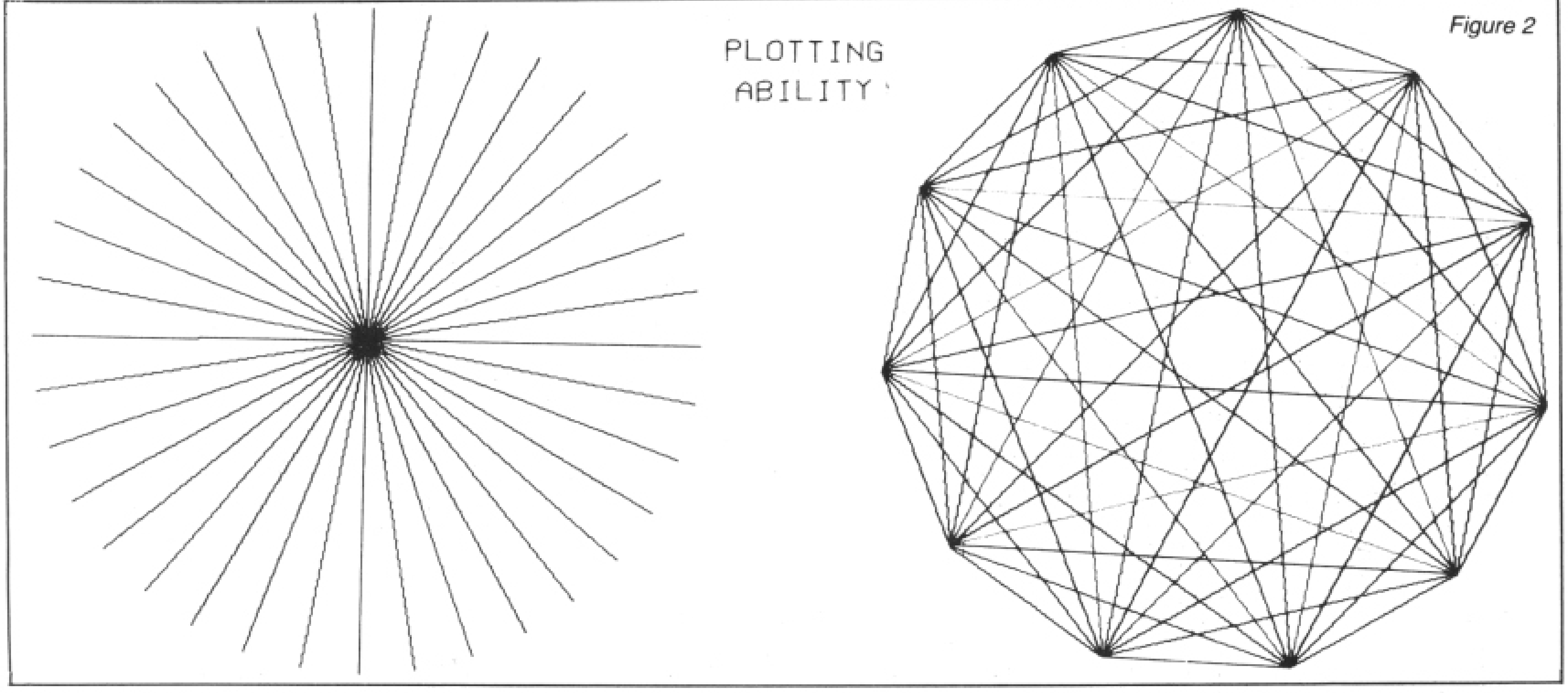


Figure 2

◀ which has adequate polystyrene reinforcement, the CGP-220 is complete with power supply cord, a small supply of test paper and owner's manual. The ink packs, which should already have been installed, are said by Tandy to be capable of printing 4 million characters in black and 3 million in colour. Tandy's latest catalogue and price list shows the price of the black ink pack at £6.95 and the tri-colour ink pack at £9.95. Paper rolls cost £9.95 for a pack of three. While little emphasis is placed by the manual on the installation and removal of ink packs it is worth pointing out the possible dangers of removing them before they are exhausted. At least one person has tried this and suffered the consequences of an ink bath for his pains.

The mushroom-coloured plastic case measuring about 38cm by 30cm by 9cm is very solidly made with none of the flexibility evident on some, low-cost printers. I had no incentive to interfere with the internal mechanism of the printer but am sure that if its external finish and fit is any indication the quality of construction is high. Supplied with both serial (RS232 not RS232C) and Centronics ports, the CGP-220 is compatible with all the Tandy range of computers as well as the Dragon 32 and quite a wide range of others. As ever, my advice would be to insist on seeing the printer connected and working with your own computer or one identical to it before shelling out hard-earned brass.

The CGP-220 uses the subtractive system of colour reproduction, similar to your colour negative (print) films, where the colours yellow, magenta and cyan are mixed in different proportions to produce all other colours. It is able to print both characters and graphics in seven colours — black, red, green, yellow, blue, magenta and violet. It offers standard or elongated characters, bit addressable graphics on a resolution of 640 dots per line printing on plain cut sheet or roll paper. No provision is made, as far as I could see, for the pre-setting of either "top of form" or form length — important to some word processor programs.

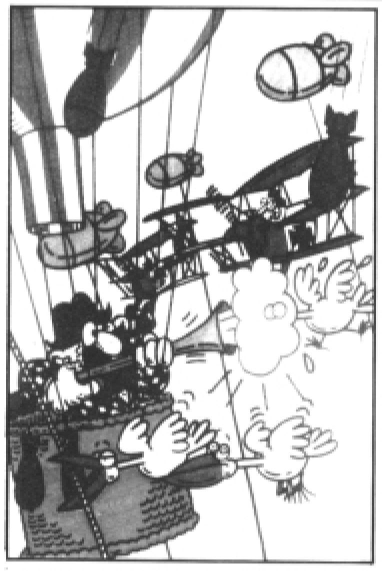
The documentation supplied with the CGP-220 is quite poor compared with the normal high and informative Tandy standards. In view of the novelty of this "hi-tech" approach to colour printing I was surprised to find that the manual had little to say about how the system works. It seems, in fact, that the ink is transferred in tiny quantities from the print head to the paper by means of a super fast high-density spark. Each dot of the matrix is formed by a separate operation and applied one dot line (640 dots) at a time. Seven passes of the head are therefore needed to build up a complete text line.

Used with the Tandy 16K Colour Computer a screen dump program is available. I would imagine that it can only be a matter of time before a similar utility becomes available for the Dragon 32. While quite slow, the screen dump is said to take between six and 20 minutes — the examples that I have seen have been most impressive.

Print speed is rather slow even in text mode at 37 characters per second (nominal). Even using the character dump built into the printer as a test mode I was unable to better 30 CPS (10 line × 80 col character dump in about 27 seconds). In fairness most of the printer manufacturers seem to base quoted speeds on con- ▶

COMPUTERHOUSE

ANNOUNCE THE LAUNCH OF AN EXCITING NEW RANGE OF DRAGON SOFTWARE.



BASIL GOES BALLOONING

The first of a series of adventures enjoyed by the indomitable Sir Basil Spice, the eccentric yet heroic star of these games. Can you help Sir Basil to rid Brighton of the birds who are pecking away the towns only defences against the enemy? Armed with only a blunderbuss, and three hot air balloons, you must guide our hero into the sky. All action machine code game, fiendishly designed to get more difficult as you get better at it. **£7.95.**



BOMBS AWAY BASIL

The next game in the series has Sir Basil trying to defuse the bombs before he is attacked by his only known fear, **SPIDERS!!** Yes, the truth is finally out and, the cunning natives place spiders near the bombs they plant. The first lot are pretty thick – and blind! But don't be fooled, they get very clever indeed. Also all machine code with some of the fastest graphics you have seen yet on the Dragon. **£7.95.**

MXT I/O CONTROLLER

Specially developed for the Dragon Users (Club)

To control your Central Heating, Alarm Systems, Train Set, Robot or anything which requires accurate timed control of external devices.
*Simple-to-use Plug-in Cartridge with support. *Up to 4 devices can be controlled at once. *On-screen real-time Clock in Hrs. Mins. Secs. *Easy to program in BASIC, with 7 New BASIC commands: CLOCK, CLOCK SET, CLOCK CHK SWITCHIN, SWITCHON, SWITCHOFF & MONITOR. *Useful M/C. Monitor for your M/Cs programs. *Comprehensive User Manual with examples.
MXT2 – With 2 Relays & 2 TTL/CMOS lines **£39.95.**
MXT4 – With 4 Relay Switches **£45.95.** Plus 90p p. & p.

FROM JCB MICROSYSTEMS

SPEECH SYNTHESIS MODULE

Has already sold in large numbers throughout the U.K. and Europe, this cartridge module has unlimited vocabulary. Approximately 250 words are predefined. Can easily be incorporated into existing BASIC programs. Up to 40 words can be spoken from one command. Manual supplied. **£37.95.**

SOUND EXTENSION MODULE

This cartridge module allows your Dragon to create Music and Sound using five octaves. Has new built-in sound effects for games, etc. Easy to use via BASIC. Two I/O ports. Manual with examples. **£34.95.**

BASIC ENHANCER/MERGER

This brand new utility, written by John Botibol, can save up to 30% of memory in a normally presented BASIC program. It strips out REMs and unnecessary Spaces, re-organises GOSUBs and GOTOs and creates multi-statement lines, which can be longer that 255 characters, and will improve RUN Time. Concealed character facility. **Only £7.95.**

DEALERS & OVERSEAS ENQUIRIES WELCOME

THE DRAGON USERS CLUB

(Previously run by Games & Computers)

As from 14th March 1983, the Club will be run by **Computerhouse (UK) Ltd.** Due to the rapid growth and success of the Club (Now over 2,000 members worldwide), it is necessary, in the best interests of all its members, for a larger organisation to handle its administration. All members will receive full details from us shortly. Meanwhile, if you have any queries, please write direct to us at the address below.

Order Form

NAME: ______________________

ADDRESS: ______________________

______________________ TEL. No. __________

PLEASE SUPPLY:

QTY.	TITLE		TOTAL
	BASIL GOES BALLOONING	£ 7.95	
	BOMBS AWAY BASIL	£ 7.95	
	MXT I/O CONTROLLER (2 RELAY)	£39.95	
	MXT I/O CONTROLLER (4 RELAY)	£45.95	
	SPEECH SYNTHESIS MODULE	£37.95	
	SOUND EXTENSION MODULE	£34.95	
	BASIC ENHANCER/MERGER	£ 7.95	
	TOTAL ENCLOSED £		

NO CHARGE FOR POST & PACKING.

PLEASE SEND ME FURTHER DETAILS ABOUT JOINING THE CLUB ☐

CLUB MEMBERS MAY DEDUCT 10% BUT MUST ADD 50p PER ITEM P. & P.

ACCESS/BARCLAYCARD/AMERICAN EXPRESS WELCOME
Please state which type and give:

No: __________ Expiry Date: __________

COMPUTERHOUSE (UK) LTD.
9 Norwich Road, Bournemouth, Dorset, BH2 5QZ
Telephone: 0202 25418.

```
10 PRINT#-2,"NORMAL CHARACTER";
20 PRINT#-2, CHR$(27);CHR$(14);
30 PRINT#-2,"ELONGATED";
40 PRINT#-2, CHR$(27);CHR$(15);
50 PRINT#-2,"BACK TO NORMAL"
60 PRINT#-2,"NORMAL DOT PITCH"
70 PRINT#-2,CHR$(27);CHR$(78)"1:1 RATIO DOT PITCH"
80 PRINT#-2,CHR$(27);CHR$(80);"BACK TO NORMAL DOT PITCH"
90 PRINT#-2,CHR$(27);CHR$(78);CHR$(27);CHR$(14)"THIS IS ELONGATED 1:1 RATIO"
100 PRINT#-2,CHR$(27);CHR$(15);CHR$(27);CHR$(80)"BACK TO NPORMAL AGAIN"
110 PRINT #-2,CHR$(28) CHR$(30)"T"
120 PRINT#-2,CHR$(27);CHR$(16) CHR$(1);CHR$(44);
130 PRINT#-2,"THIS IS THE 300TH DOT POSITION"
140 PRINT#-2,CHR$(27) CHR$(84) CHR$(52)"THIS TEXT IS IN BLUE"
150 PRINT#-2,CHR$(27) CHR$(84) CHR$(49)"THIS TEXT IS IN RED"
160 PRINT#-2,CHR$(27);CHR$(67);CHR$(3);
170 PRINT#-2,CHR$(128);CHR$(128);CHR$(128)
180 PRINT#-2, CHR$(16);CHR$(16);CHR$(16);
190 PRINT#-2,CHR$(1);CHR$(1);CHR$(1);
200 PRINT#-2,CHR$(18)
210 FORN=48T054
220 PRINT#-2,CHR$(27);CHR$(84);CHR$(N);CHR$(255)
230 NEXTN
```

Figure 3

```
NORMAL CHARACTERE L O N G A T E DBACK TO NORMAL
NORMAL DOT PITCH
1:1 RATIO DOT PITCH
BACK TO NORMAL DOT PITCH
T H I S   I S   E L O N G A T E D   1 : 1   R A T I O
BACK TO NPORMAL AGAIN
TTTTTTTTTTTTTTTTTTTTTTTTTTTTTT
                                                    THIS IS THE 300TH DOT POSITION

THIS IS THE BIT IMAGE MODE
```

Figure 4

◀ tinuous repetition of the same character. By way of compensation for its slow speed the CGP-220 is extremely quiet.

Loading of either the roll paper or single cut sheets is straightforward. Care is needed, however, to ensure that the roll paper is correctly aligned to prevent hang-ups.

As with most modern printers the CGP-220 is sent instructions in the form of control codes. *Fig 3* is a sample program listing showing the way in which the various codes are used and *Fig 4* is a sample of the results. Physical controls are in the form of a bank of three touch sensitive switches to handle ON/OFF line, FEED and RESTART (after replacing exhausted paper or jam) and three LEDs on the front of the machine for READY, ALERT and POWER. A lever is provided on the right-hand end of the carriage which locks and unlocks the carriage and caps the ink nozzles and permits "pumping" of the ink supply to increase the print density. On the back of the machine is a switch which allows a choice of 600 or 1200 baud when used with the serial I/F (also located on the back together with the parallel I/F and the power supply socket).

A simple test routine, pressing the FEED button after unlocking the carriage, prints out a single, four-coloured, horizontal bar and allows a check to be made on the print density and ink supply. The normal routine of turning the power ON with the FEED switch held down outputs a multi-coloured "barber's pole" character dump. Print density is, at best, poor. In the TEXT mode the individual dots of the matrix stand out very clearly and even in the bit image mode I was not impressed by either the resolution of the print or the density of colour. Certain types of paper, those with any sort of glazed finish or those which are very absorbent, seem to be incompatible with the type of ink used as smudged print or runs were detected on occasions.

Direct comparison of these two printers may be said by some to be unrealistic, bearing in mind the wide difference in costs and facilities. However, I am convinced that comparisons of this sort are valid. The MCP-40 and its cousins represent a very cheap, high-quality if somewhat slow solution to the problem of providing hard copy. As a worthwhile added bonus the good resolution and density of the colour ouput offers the small business the facility ot providing multi-coloured graphs, pie charts and so on. On the other hand the CGP-220 is, by comparison, far more expensive and possibly less versatile. Certainly for the home computer enthusiast the Tandy is, in my view, much too expensive. It may be more suitable for the small or medium size business but, if I were in the market for a new printer, I would certainly want to ask myself whether I really needed a colour facility when for considerably less money I would be able to get a machine like the Epson RX80FT. If colour was a prerequisite then I would also look closely at the new Seikosha GP700A with its multi-coloured ribbon.

I have, in fact, as a result of the work for this article, purchased an MCP-40 for production of business graphics. The CGP-220, while extremely well built and robust, is unlikely to find its way into my stock of equipment. ■



Time truck

Simon Rundell *extends a*

THIS GAME SETS you up in a truck (the yellow dot). The object is to get as far as you can, without running out of fuel or falling to pieces. Scattered along the highway are obstructions and fuel tanks. When you hit an obstruction your damage tally is increased. The obstructions are the black dots. The fuel, indicated by a white dot, increases by a random amount.

The scrolling is done with a machine code subroutine loaded in at location 32051 (decimal). It is called using the EXEC command. Using the EXEC command when a machine code program is not present causes the machine to crash. The assembler listing is given below (in DASM assembler shorthand):

```
LDX #$5E0
LDY #$600
```

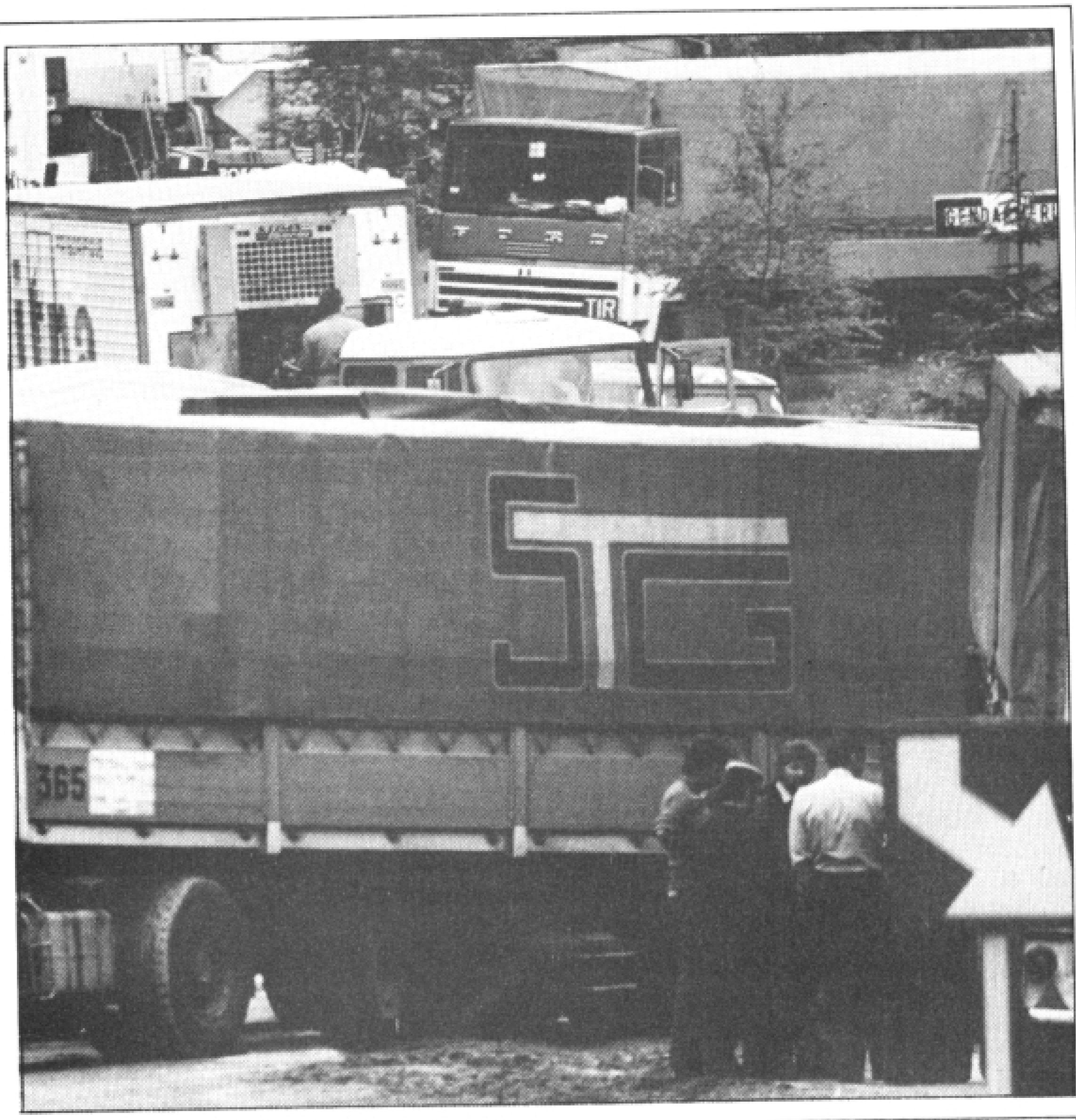
```
1 PO=14:G=5:F=500:ST=2
2 CLS:PRINT@128,"       t r u c k
 (C) RUNDELLSOFT 1983"
3 FORN=1TO1000:NEXT
4 GOSUB38
5 POKE1024+288+PO,143+16:POKE1024+320+PO,143+112
6 FOR N=1TO500STEPG:NEXT
7 FOR P9=1TOST:POKE1024+RND(31),128:NEXT
8 IF RND(10)=1 THEN POKE1024+RND(31),143+64
9 EXEC32051
10 IF D>25  AND D<50 THEN D9=D9+1
11 IF D9=16 THEN PRINT@0,"DAMAGE WARN.";:D9=0
12 IF D>50 AND D<100 THEN D8=D8+1
13 IF D8=5 THEN PRINT@0,"danger;damage";:D8=0
14 IF D>100 THEN CLS2:GOSUB45
15 X=JOYSTK(0):IF X<10 THEN POKE1024+288+PO,143+112:POKE1024+320+PO,143+112:PO=P
O-1
16 IF X>50 THEN POKE 1024+288+PO,143+112:POKE1024+320+PO,143+112:PO=PO+1
17 IF PEEK(65280)=126 OR PEEK(65280)=254 THEN GOSUB31
18 DIST=DIST+10
19 IF I$="1" THEN G=1
20 IF I$="2" THEN G=2
21 IF I$="3" THEN G=3
22 IF I$="4" THEN G=4
23 IF I$="5" THEN G=5
24 IF DIST>1000 THEN PRINT@128,"YOU HAVE COMPLETED STAGE";ST-1:PLAY"T4O1CEGECCCE
DEGEC":ST=ST+1:DIST=0:F=F+RND(200)+50
25 F=F-2:IF F>25 AND F<50 THEN P=P+1:IF P=5 THEN PRINT@0,"FUEL WARNING";:POKE102
4+RND(31),143+64::P=0
26 IF F<25 AND F>0 THENP1=P1+1:IF P1=5 THEN PRINT@0,"FUEL DANGER";:POKE1024+RND(
31),143+64:P1=0
27 IF F<0 THEN PRINT@0,"fuel out":PLAY"T8CEGECCCEDEGEC":GOTO 43
28 IF PEEK(1024+288+PO)=128 THEN PLAY"T12CEGECCCEDEGEC":PRINT@0,"obstruction";:D
```

to try rides

truck riding invitation

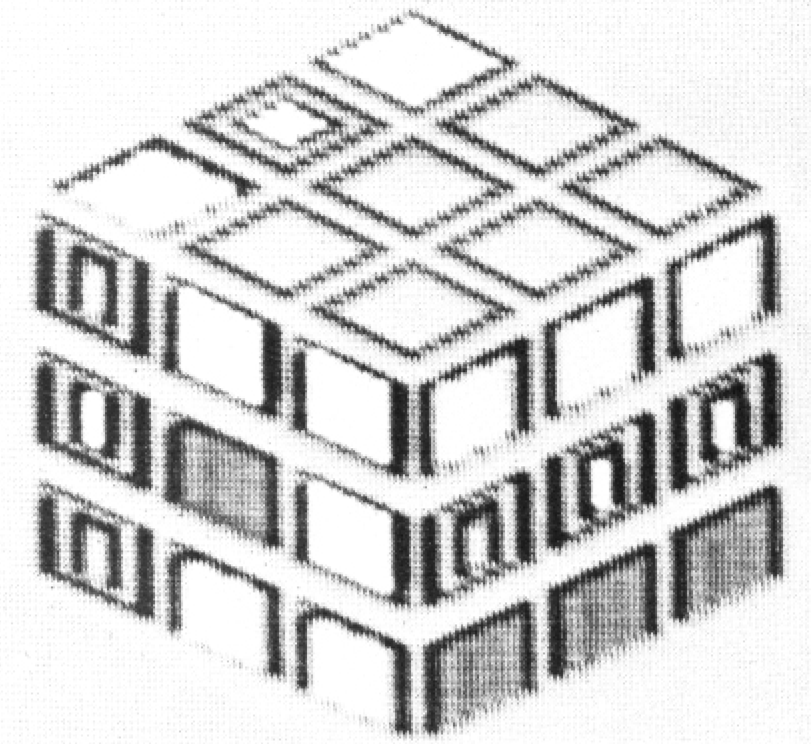
```
@LOOP   LDD ,– – X
        STD ,– – Y
        CMPX #$400
        BGT @LOOP
        LDX #$7D00
@LOOP2  LDD ,– – X
        STD , – – Y
        CMPY #$400
        BGT @LOOP2
        RTS
```

All blocks are POKEd direct on to the text screen (1024 decimal or 400 hex). The warning information is PRINTed at position 0 and the scroller takes it neatly off the page. On running the program the text screen develops extra characters on screen. This is due to the scroller and is different every time the program is loaded, one cannot control this factor. ■



```
=D+RND(5)
29 IF PEEK(1024+288+PO)=143+64 THEN PLAY"T12CEGECCCEDEGEC":PRINT@0,"fuel!!";:F=F
+RND(20)
30 GOTO 5
31 CLS:PRINT@0,"       report"
32 PRINT"distance";DIST
33 PRINT"distance left";1000-DIST
34 PRINT"damage";D
35 PRINT"fuel";F
36 FOR N=1TO5000:NEXT:CLS8:RETURN
37 REM***************************
38 REM*************************          **MACHINE CODE*******
39 DATA 8E,05,E0,10,8E,06,00,EC,83,ED,A3,8C,04,00,2E,F7,8E,7D,00,EC,83,ED,A3,10,
8C,04,00,2E,F6,39,"END"
40 P=P+1:READ A$:IF A$="END" THEN RETURN
41 POKEP+32050,VAL("&H"+A$)
42 GOTO 40
43 PRINT@0,"THIS GAME IS OVER                 ' FUEL=";F;:PRINT"DAMAGE=";D:PRINT"STA
GE";ST
44 FOR N=1TO1000:NEXT:RUN
45 FOR N6=1TO32
46 RN=RND(5)
47 IF RN=0 THEN PRINT@0,"CRASH";
48 IF RN=1 THEN PRINT@0,"BANG";
49 IF RN=2 THEN PRINT@0,"WALLOP";
50 IF RN=3 THEN PRINT@0,"@!@ @**#!!@!@!";
51 IF RN=4 THEN PRINT@0,"BLAM!";
52 IF RN=5 THEN PRINT@0,"@!@!##!!@!@!@!!#!!!";
53 EXEC32051
54 FOR N=1TO100:NEXT:NEXTN6
55 PRINT@128,"YOU HAVE CRASHED!!";
56 FORN=1TO5000:NEXTN
57 RUN
```

Solve the cube



Play ***Jonathan Strauss's*** *Rubicube*

```
10 D=1:E=2:F=3:G=4:H=5:I=6:J=7:K=8:L=9
20 DIM Z$(50)
30 CLS:PRINT"    ****** CUBIC QUIZES******"
50 O=0
60 PRINT:PRINT:PRINT"WOULD YOU LIKE A SAVED CUBE?"
70 M$=INKEY$:IF M$="" THEN 70
80 IF M$="N" THEN 130
90 IF M$="Y" THEN 110
100 GOTO 70
110 GOSUB 2000
120 GOTO 170
130 FOR N=1 TO 9
140 PMODE 3:PCLS:SCREEN 1,0
150 A(N)=0:B(N)=2:C(N)=3:D(N)=4
160 E(N)=5:F(N)=6:NEXT
170 GOSUB 1150
180 M$=INKEY$:IF M$=""THEN 180
190 IF M$=" "THEN GOSUB 1150 ELSE GOSUB 2090
200 IF M$="P" THEN GOTO 1920
210 IF M$="," THEN GOSUB 2150
220 GOSUB 240
230 GOTO 180
240 IF M$="A" THEN GOSUB 440
250 RESTORE
260 IF M$="Q" THEN GOSUB 520
270 IF M$="S" THEN GOSUB 560
280 IF M$="W" THEN GOSUB 590
290 IF M$="D" THEN GOSUB 630
300 IF M$="E" THEN GOSUB 680
310 IF M$="F" THEN GOSUB 720
320 IF M$="R" THEN GOSUB 760
330 IF M$="G" THEN GOSUB 800
340 IF M$="T" THEN GOSUB 820
350 IF M$="H" THEN GOSUB 860
360 IF M$="Y" THEN GOSUB 910
370 IF M$="2" THEN GOSUB 950
380 IF M$="1" THEN GOSUB 980
390 IF M$="4" THEN GOSUB 1020
400 IF M$="3" THEN GOSUB 1040
410 IF M$="6" THEN GOSUB 1080
420 IF M$="5" THEN GOSUB 1110
430 RETURN
440
450 P1=A(D):P2=A(G):P3=A(J):A(D)=D(D):A(G)=D(G):A(J)=D(J)
460 D(D)=F(D):D(G)=F(G):D(J)=F(J)
470 F(1)=B(D):F(G)=B(G):F(J)=B(J)
480 B(D)=P1:B(G)=P2:B(J)=P3
490 P1=E(F):P2=E(E):E(F)=E(D):E(E)=E(G):E(D)=E(J):E(G)=E(K):E(J)=E(L):E(K)=E(I)
500 E(L)=P1:E(I)=P2
510 RETURN
520 FOR N=1 TO 3
530 GOSUB 440
540 NEXT
550 RETURN
560 P1=A(E):P2=A(H):P3=A(K):A(E)=D(E):A(H)=D(H):A(K)=D(K):D(E)=F(E):D(H)=F(H):D(
K)=F(K)
570 F(E)=B(E):F(H)=B(H):F(K)=B(K):B(E)=P1:B(H)=P2:B(K)=P3
580 RETURN
590 FOR N=1 TO 3
600 GOSUB 560
610 NEXT
620 RETURN
630 P1=A(F):P2=A(I):P3=A(L):A(F)=D(F):A(I)=D(I):A(L)=D(L):D(F)=F(F):D(I)=F(I):D(
```

THE OBJECT OF the project is to simulate the famous Rubic cube on the Dragon, with a subroutine to remember the moves that one has made. Using this facility, one can back-track, undoing and redoing previous moves.

Because solving the cube may take much time, a facility to save one's position in a data file on tape is also incorporated. Likewise, there is a choice at the beginning of the program between starting a new cube and using one already saved on tape. The algorithm by which the updated version of the cube is determined is the major part of the program.

The cube has six sides, each with nine different squares. There are six possible colours that each square may have. Within the program, there are thus six different arrays corresponding to each side: A (9), B (9), C (9), D (9), E (9) and F (9). The arrays have a code number contained within them that corresponds to the pattern (colour) that the computer should draw for the individual square later on in the program. Depending on the move that the user has made, different combinations of the elements in the array will be swapped over.

Sides

On running the program only three sides of the cube are visible at any one time, A, B and C. All the moves that are possible can be made by revolving one of the columns, whether to one side or another. There are six vertical columns, V1, V2, V3, V4, V5 and V6; and three horizontal columns, H1, H2, H3. From left to right:

V1 = B(1), B(4), B(7), A(1), A(4), A(7)
V2 = B(2), B(5), B(8), A(2), A(5), A(8)
V3 = B(3), B(6), B(9), A(3), A(6), A(9)
V4 = C(7), C(4), C(1), A(3), A(2), A(1)
V5 = C(8), C(5), C(2), A(6), A(5), A(4)
V6 = C(9), C(6), C(3), A(9), A(8), A(7)

From top to bottom:
H1 = B(7), B(8), B(9), C(1), C(2), C(3)
H2 = B(4), B(5), B(6), C(4), C(5), C(6)
H3 = B(1), B(2), B(3), C(7), C(8), C(9)

If, for example, the user wishes to revolve V3 downwards, then the codes contained in the arrays are changed to the new code of the square that has "moved to that position". Thus, in moving V(3) downwards:

First moves	*Second moves*
B(3) becomes A(3)	C(1) becomes C(3)
B(6) becomes A(6)	C(2) becomes C(6)
B(9) becomes A(9)	C(3) becomes C(9)
A(3) becomes C(3)	C(6) becomes C(8)
A(6) becomes D(6)	C(9) becomes C(7)
A(9) becomes D(9)	C(8) becomes C(4)
D(3) becomes F(9)	C(7) becomes C(1)
D(6) becomes F(6)	C(4) becomes C(2)
D(9) becomes F(3)	
F(9) becomes B(3)	
F(6) becomes B(6)	
F(3) becomes B(9)	

However, if this is done, the old "codes" of B(3), B(6) and B(9); C(1) and C(2) are best so it is necessary to have some pointer of these values. Before the first moves:

```
L)=F(L)
640 F(F)=B(F):F(I)=B(I):F(L)=B(L):B(F)=P1:B(I)=P2:B(L)=P3
650 P1=C(D):P2=C(E)
660 C(D)=C(F):C(E)=C(I):C(F)=C(L):C(I)=C(K):C(L)=C(J):C(K)=C(G):C(J)=P1:C(G)=P2
670 RETURN
680 FOR N=1 TO 3
690 GOSUB 630
700 NEXT
710 RETURN
720 P1=A(D):P2=A(E):P3=A(F):A(D)=E(L):A(E)=E(I):A(F)=E(F):E(L)=F(L)
730 E(I)=F(K):E(F)=F(J):F(L)=C(D):F(K)=C(G):F(J)=C(J):C(D)=P1:C(G)=P2:C(J)=P3
740 P1=B(L):P2=B(K):B(L)=B(J):B(K)=B(G):B(J)=B(D):B(G)=B(E):B(D)=B(F):B(E)=B(I):
B(F)=P1:B(I)=P2
750 RETURN
760 FOR N=1 TO 3
770 GOSUB 720
780 NEXT
790 RETURN
800 P1=A(G):P2=A(H):P3=A(I):A(G)=E(K):A(H)=E(H):A(I)=E(E):E(K)=F(I):E(H)=F(H):E(
E)=F(G):F(I)=C(E):F(H)=C(H):F(G)=C(K):C(E)=P1:C(H)=P2:C(K)=P3
810 RETURN
820 FOR N=1 TO 3
830 GOSUB 800
840 NEXT
850 RETURN
860 P1=A(J):P2=A(K):P3=A(L):A(J)=E(J):A(K)=E(G):A(L)=E(D):E(J)=F(F):E(G)=F(E):E(
D)=F(D)
870 F(F)=C(F):F(E)=C(I):F(D)=C(L):C(F)=P1:C(I)=P2:C(L)=P3
880 P1=D(E):P2=D(F):D(F)=D(D):D(E)=D(G):D(D)=D(J):D(G)=D(K):D(J)=D(L):D(K)=D(I):
D(L)=P2:D(I)=P1
890 IF V<1 THEN V=1
900 RETURN
910 FOR N=1 TO 3
920 GOSUB 860
930 NEXT
940 RETURN
950 P1=C(D):P2=C(E):P3=C(F):C(D)=B(J):C(E)=B(K):C(F)=B(L):B(J)=E(D):B(K)=E(E):B(
L)=E(F):E(D)=D(F):E(E)=D(E):E(F)=D(D):D(F)=P1:D(E)=P2:D(D)=P3
960 P1=A(J):P2=A(K):A(J)=A(L):A(K)=A(I):A(L)=A(F):A(I)=A(E):A(F)=A(D):A(E)=A(G):
A(D)=P1:A(G)=P2
970 RETURN
980 FOR N=1 TO 3
990 GOSUB 950
1000 NEXT
1010 RETURN
1020 P1=C(G):P2=C(H):P3=C(I):C(G)=B(G):C(H)=B(H):C(I)=B(I):B(G)=E(G):B(H)=E(H):B
(I)=E(I):E(G)=D(I):E(H)=D(H):E(I)=D(G):D(I)=P1:D(H)=P2:D(G)=P3
1030 RETURN
1040 FOR N=1 TO 3
1050 GOSUB 1020
1060 NEXT
1070 RETURN
1080 P1=C(J):P2=C(K):P3=C(L):C(J)=B(D):C(K)=B(E):C(L)=B(F):B(D)=E(J):B(E)=E(K):B
(F)=E(L):E(J)=D(L):E(K)=D(K):E(L)=D(J):D(L)=P1:D(K)=P2:D(J)=P3
1090 P1=F(D):P2=F(E):F(D)=F(F):F(E)=F(I):F(F)=F(L):F(I)=F(K):F(L)=F(J):F(K)=F(G)
:F(J)=P1:F(G)=P2
1100 RETURN
1110 FOR N=1 TO 3
1120 GOSUB 1080
1130 NEXT
1140 RETURN
1150 RESTORE
1160 DATA 62,94,78,102,94,110,62,76,78,84,94,92,62,58,78,66,94,74
1170 FOR C=1 TO 9
1180 Q=B(C)
1190 READ X,Y
1200 GOSUB 1350
1210 NEXT C
1220 FOR C=1 TO 9
1230 DATA 110,82,126,74,142,66,110,100,126,92,142,84,110,118,126,110,142,102
1240 Q=C(C)
1250 READ X,Y
1260 GOSUB 1530
1270 NEXT C
1280 DATA 64,54,80,62,96,70,80,46,96,54,113,62,96,38,112,46,129,54
1290 FOR C=1 TO 9
1300 Q=A(C)
1310 READ X,Y
1320 GOSUB 1680
1330 NEXT C
1340 RETURN
1350 '**************************
1360 IF Q=PPOINT((X+2),(Y+4)) THEN RETURN
1370 PAINT ((X+4),(Y+6)),1,1
1380 LINE (X,Y)-((X+12),(Y+6)),PSET
1390 LINE -((X+12),(Y+18)),PSET
1400 LINE -(X,(Y+12)),PSET
1410 LINE -(X,(Y+2)),PSET
1420 IF Q=0 OR Q=1 OR Q=2 OR Q=3 OR Q=4 THEN 1500
1430 PAINT ((X+2),(Y+4)),1,1
1440 LINE ((X+4),(Y+4))-((X+8),(Y+6)),PSET
1450 LINE -((X+8),(Y+14)),PSET
1460 LINE -((X+4),(Y+12)),PSET
1470 LINE -((X+4),(Y+4)),PSET
1480 IF Q=5 THEN Z=6 ELSE Z=7
1490 PAINT ((X+6),(Y+8)),Z,8
1500 GOSUB 1850
1510 RETURN
1520 '**************************
1530 IF Q=PPOINT((X+2),(Y+2))THEN RETURN
1540 PAINT ((X+6),Y),1,1:Y=Y-2:LINE(X,Y)-(X+12,Y-6),PSET
1550 LINE -(X+12,Y+6),PSET
1560 LINE -(X,Y+12),PSET
1570 LINE -(X,Y),PSET
1580 IF Q=0 OR Q=1 OR Q=2 OR Q=3 OR Q=4 THEN 1650
1590 LINE ((X+4),(Y+2))-((X+8),(Y-2)),PSET
```

P = B(3)
P1 = B(6)
P2 = B(9)

instead of the last three of the first moves:

F(9) = P
F(6) = P1
F(3) = P2

after these

P = C(1)
P1 = C(2)

at the end of the second set of moves

C(7) = P
C(4) = P1

By doing the above none of the codes of colours in the arrays are lost when swapped.

Each of the 18 possible sets of array changes are calculated and made into subroutines of the program.

It is necessary to precode the arrays (sides) with their correct colour at the beginning of the program (if the user is not continuing with a position saved in a data file on tape). This can be done in two ways, either randomly or with one colour (code) for each side (as with the finished cube).

Disadvantages

Both ways have their disadvantages. If the second is used, the user must "muddle" the cube up himself before starting. If the first choice is taken, the program would have to be somewhat overcomplicated because a truly random starting point may result in a cube that is impossible to complete.

For this reason I have decided to code each side with its own code number (colour) unique to itself.

It is important to be able to make moves quickly so it is necessary to choose carefully the keys which determine the moves. As I have said, the displayed cube has six vertical columns (from left to right V1, V2, V3, V4, V5 and V6) and three horizontal ones (H1, H2 and H3 — from top to bottom).

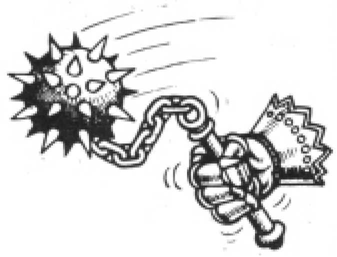
Pressing Q moves V1 up, A moves it down; W moves V2 up, 5 down; E moves V3 up, D down; R moves V4 up, F down; T moves V5 up, G down; Y moves V6 up, H down. So the QWERTY keys move the vertical columns up, ASDFGH move them down. Pressing 1 moves H1 left, 2 moves it right; 3 moves H2 left, 4 right; 5 moves H3 left, 6 right. So the 135 keys move the horizontal columns left, 246 move them right.

To muddle up the cube, press any of these keys randomly, then press the space bar and the cube to be solved will be drawn.

In the program, the INKEY$ function is used to return the key pressed to a string variable.

Drawing the cube takes longer than the actual swapping of the contents of the arrays. Because of this I have decided that instead of the updated version being ▶

WINDRUSH MICRO SYSTEMS



MACE by Graham Trott

EDITOR
ASSEMBLER
MONITOR

£29.95

DRAGON 32 CARTRIDGE

An 80 page reference manual describes MACE, the architecture of the MC6809 processor and its powerful addressing modes. The MC6809's 78 basic Assembly language mnemonics are also described in considerable detail.

The **EDITOR** can .... Insert line(s), delete line(s), overlay a line, replace a line, append text to a line, move up/down one line at a time, find a string, change string 1 to string 2, load a file from tape, save a file to tape, print (list) lines, call the ASSEMBLER or the MONITOR and return to BASIC.

The **ASSEMBLER** can .... Assemble without a listing to check for errors, assemble to screen, assemble to printer, assemble to tape, assemble to memory, assemble to memory with an offset, assemble with a sorted cross reference table and many combinations of these. The Assembler also provides TEXTUAL error messages to help locate programming mistakes quickly. When an error is encountered you can INSTANTLY return to the EDITOR and fix it! MACE supports local labels and global labels up to 8 characters in length.

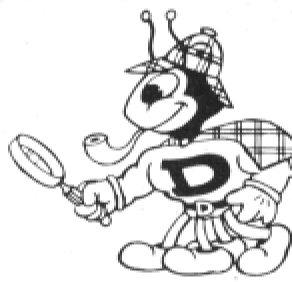
The **MONITOR** can .... View memory, examine and change memory, insert a character into a range of memory, shift the contents of memory from one location to another, find a byte or string of bytes in memory, set/clear a breakpoint, display the stacked registers, jump to a user program and continue execution of a user program after encountering a breakpoint. A simple hexadecimal calculator is also provided.

MACE's EDITOR/ASSEMBLER/MONITOR, DRAGON's BASIC, a BASIC program, an Assembly Language Source program, and machine code produced by MACE may all reside in memory together! You have INSTANT access to any of them.

R E V I E W S

PERSONAL COMPUTER NEWS ...... 'I would recommend MACE to anyone who wants to use the DRAGON to learn 6809 assembly language or to write serious assembly language programs'

PERSONAL COMPUTING TODAY .... 'This package has a very professional feel about it ...'



D-BUG by Stewart Bush

TRACER
MONITOR
DISASSEMBLER

£29.95

DRAGON 32 CARTRIDGE

D-BUG is a complete software emulation of the MC6809. This enables D-BUG to maintain complete control of the real MC6809 when illegal instructions or program errors are encountered. Properly used D-BUG will make working with assembly language as easy as BASIC but a lot more rewarding!

D-BUG is **POWERFUL** It is a program analysis tool that combines a single step tracer, a disassembler, and a system monitor all in one. It even has its own RAM so it does not need to steal one single byte of the DRAGONs 32K!

D-BUG is **FRIENDLY** It's 36 commands are instantly available through a menu to simplify use and eliminate systen crashes caused by errors.

D-BUG is **THOROUGH** During program trace it follows the execution of program code an instruction at a time under your full control. As each instruction is executed the contents of the 6809 registers are displayed along with a dissassembly of the instruction about to be executed.

D-BUG is **COMPLETE** Everything you need to analyze and de-bug a machine code program resident anywhere in the DRAGONs 32K memory is provided in one ROM/RAM cartridge. D-BUG does not use the SWI instruction for its operation so it is capable of working with program code in ROM. This **UNIQUE** feature enables you to trace through the BASIC ROM code and see what makes it tick!

D-BUG is **IMPOSSIBLE** to describe fully in this limited space so we will just give you a summary of the available commands: Single step trace; auto-trace; execute current subroutine; disassemble; set breakpoint; set subroutine nest level counter; alter target 'CC', 'A', 'B', 'DP', 'X', 'Y', 'U', 'SP' or 'PC' register; display target registers; memory examine/change; byte finder; fill memory; view memory in HEX and ASCII; calculate relative branch offset; shift blocks of memory (they may overlap); jump to subroutine; write title/notes to printer. Toggle (on/off) functions include: echo output to printer; execute BASIC ROM routines at full processor speed; trace/disassemble; dump registers after each command; display registers after each instruction when in auto trace; delay between instructions when in auto-trace.

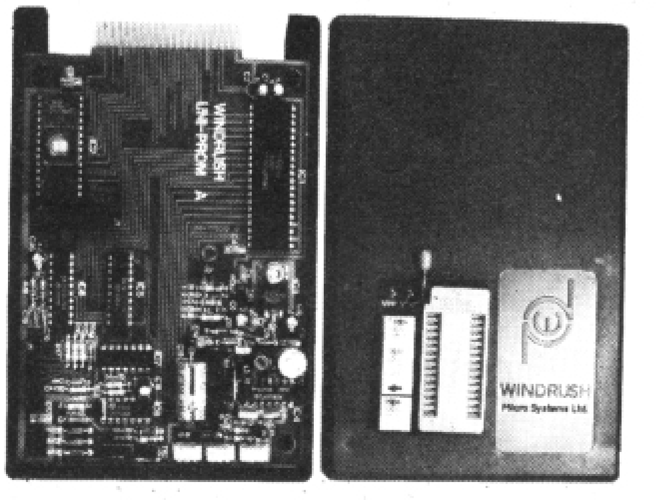


BUG ZAPPER

MULTI-PROGRAMMER

£79.95

DRAGON 32 CARTRIDGE



PROFESSIONAL QUALITY EPROM PROGRAMMER FOR THE DRAGON-32

Built-in ROM provides full range of menu driven EPROM programming facilities including: FILL, MOVE, EXAMINE/CHANGE, HEX-ASCII DUMP, CRC CHECKSUM, COPY EPROM, VERIFY EPROM, PROGRAM EPROM, START/STOP CASSETTE MOTOR, SAVE DATA TO CASSETTE and LOAD DATA FROM CASSETTE.

EPROMS supported include: Intel 2758, Texas 2508, Intel 2716, Texas 2516, Intel 2732 and 2732A, Texas 2532, Motorola MCM68764/6, Intel 2764*, Texas 2564, Intel 27128*, and Intel 27256*. TRI-VOLT EPROMS are NOT supported!

* Intels 'Intelligent Programming Algorithm' (tm) is available for these devices. This algorithm enablas these devices to be programmed in one sixth of the conventional time with a dramatic improvement in programming margin.

6809 FLEX(TM) SOFTWARE / HARDWARE

PL/9 by G. Trott	EDITOR/COMPILER/TRACER	114.00
MACE "	EDITOR/ASSEMBLER w/XMACE EDITOR/6800/3 XASSEMBLER	57.00
ASMO5 "	EDITOR/6805 CROSS ASSEMBLER	57.00
GT-BUG "	6809 SYSTEM MONITOR (with source listing)	30.00
'C' by J. McCosh	UNIX VII COMPATIBLE ... W/FLOATS & DOUBLES	191.00
D-BUG by S. Bush	6809 TRACER/DISASSEMBLER	57.00
INTROL 'C'	INTROL 'C' COMPILER	547.00
OMEGA PASCAL	OMEGASOFT PASCAL COMPILER	375.00
OMEGA RALLI	OMEGASOFT RELOCATING ASSEMBLER/LINKER	104.00
LUCIDATA P69-3	LUCIDATA PASCAL	145.00
SCREDITOR III	EDITOR/WORD PROCESSOR	145.00
DYNACALC	ELECTRONIC SPREAD SHEET	175.00
DYNAMITE+	DISASSEMBLER	175.00
RMS	DATA BASE MANAGER	206.00
EDITOR	TSC TEXT EDITOR (SP09-02)	61.00
ASSEMBLER	TSC 6809 ASSEMBLER (SP09-03)	61.00
DEBUG	TSC DEBUG PACKAGE (SP09-05)	84.00
UTILITIES	TSC UTILITIES PACKAGE (SP09-11)	84.00
DIAGNOSTICS	TSC DIAGNOSTICS PACKAGE (SP09-12)	84.00
PASCAL	TSC NATIVE CODE PASCAL (SP09-15)	191.00
XBASIC	TSC EXTENDED BASIC W/17 DIGIT MATHS (SP09-06)	107.00
XBASIC-PC	TSC EXTENDED BASIC PRE-COMPILER (SP09-08)	61.00
SORT/MERGE	TSC SORT/MERGE PACKAGE (SP09-10)	107.00
JCP	JOB CONTROL PROGRAM (AN ENHANCED 'EXEC' FACILITY)	73.00
FLEX TOOLKIT 1	FLEX DISK REPAIR PACKAGE (FRANK HOGG)	74.00
FLEX TOOLKIT 2	EXTRA FLEX UTILITIES (FRANK HOGG)	74.00
BASIC TOOLKIT	EDIT/DECOMPILE/CROSS-REFERENCE BASIC (FRANK HOGG)	74.00

WE ALSO SELL PROFESSIONAL MC6809 DEVELOPMENT SYSTEMS RUNNING FLEX AND OS-9

SYSTEMS AVAILABLE IN DESK-TOP, SS-50, AND 3U CONFIGURATIONS

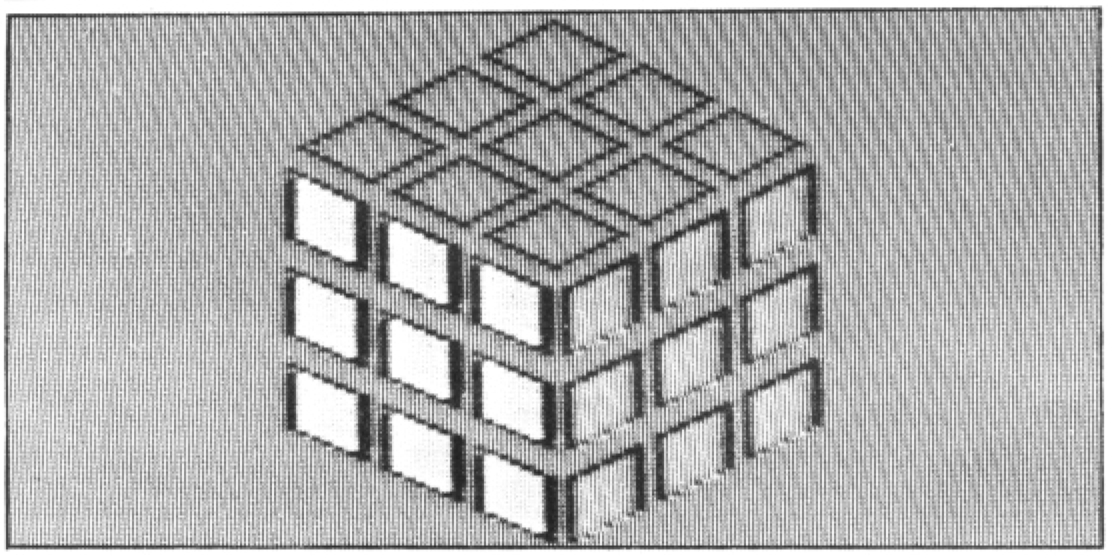
FLEX is a trademark of Technical Systems Consultants
OS-9 is a trademark of Microware Systems Corporation
DRAGON is a trademark of Dragon Data Limited

WE ARE DEALERS FOR: TSC, MICROWARE, GIMIX, SSB, FRANK HOGG LABS, AND LUCIDATA

PRICES INCLUDE POSTAGE & VAT.
VISA/ACCESS PHONE ORDERS ACCEPTED

WORSTEAD LABORATORIES,
NORTH WALSHAM, NORFOLK,
ENGLAND. NR28 9SA.
TEL: (0692) 405600

```
1600 LINE -((X+8),(Y+6)),PSET
1610 LINE -((X+4),(Y+8)),PSET
1620 LINE -((X+4),(Y)),PSET
1630 IF Q=5 THEN Z=6 ELSE Z=7
1640 PAINT ((X+6),(Y+2)),Z,8
1650 GOSUB 1850
1660 RETURN
1670 '****************************
1680 IF Q=PPOINT((X+2),Y)THEN RETURN
1690 PAINT((X+6),Y),1,1
1700 LINE(X,Y)-((X+12),(Y+6)),PSET
1710 LINE -(X+24,Y),PSET
1720 LINE -(X+12,Y-6),PSET
1730 LINE -(X,Y),PSET
1740 IF Q=0 OR Q=1 OR Q=2 OR Q=3 OR Q=4 THEN 1810
1750 LINE((X+6),Y)-((X+12),(Y+3)),PSET
1760 LINE -((X+18),(Y)),PSET
1770 LINE -((X+12),(Y-3)),PSET
1780 LINE -((X+6),(Y)),PSET
1790 IF Q=5 THEN Z=6 ELSE Z=7
1800 PAINT((X+8),(Y)),Z,8
1810 GOSUB 1840
1820 SCREEN 1,0
1830 RETURN
1840 X=X+4
1850 IF Q=1 OR Q=0 THEN PAINT((X+2),(Y+2)),1,8
1860 IF Q=2 THEN PAINT((X+2),(Y+2)),2,8
1870 IF Q=3 THEN PAINT((X+2),(Y+2)),3,8
1880 IF Q=4 THEN PAINT((X+2),(Y+2)),4,4
1890 GOSUB 2380
1900 RETURN
1910 '****************************
1920 CLS:PRINT"ENTER CASSETTE,PRESS RECORD"
1930 INPUT"NAME OF DATA FILE";M$
1940 OPEN"O",£-1,M$
1950 FOR N=1 TO 9
1960 PRINT£-1,A(N),B(N),C(N),D(N),E(N),F(N)
1970 NEXT N
1980 CLOSE£-1:END
1990 '****************************
2000 CLS:PRINT"ENTER CASSETTE IN & PRESS PLAY"
2010 INPUT"NAME OF DATA FILE";M$
2020 OPEN"I",£-1,M$
2030 FOR N=1 TO 9
2040 IF EOF(-1)THEN 2070
2050 INPUT£-1,A(N),B(N),C(N),D(N),E(N),F(N)
2060 NEXT N
2070 CLOSE £-1:RETURN
2080 '****************************
2090 IF M$="," THEN RETURN
2100 IF M$="." THEN RETURN
2110 IF M$="/" THEN RETURN
2120 AC=AC+1
2130 Z$(AC)=M$
2140 RETURN
2150 V=AC:V=V+1
2160 IF V<=1 THEN SOUND 200,8:GOTO 2220
2170 V=V-1
2180 M$=Z$(V)
2190 GOSUB 2280
2200 GOSUB 1150
2210 DRAW "BM180,68;S6;U10;R7;D4;L6;F6"
2220 M$=INKEY$:IF M$="" THEN 2220
2230 IF M$="/" THEN AC=V-1:PCLS:GOSUB 1150
2240 IF M$="/" THEN RETURN
2250 IF M$="," THEN 2160
2260 IF M$="." THEN GOSUB 2320
2270 GOTO 2220
2280 FOR N2=1 TO 3
2290 GOSUB 240
2300 NEXT
2310 RETURN
2320 '
2330 IF V>AC THEN SOUND20,8
2340 M$=Z$(V)
2350 GOSUB 240
2360 GOSUB 1150
2370 V=V+1: RETURN
2380 IF Q=0 THEN Q=Q+5
2390 SOUND((Q*40)-5),1
2400 RETURN
2410 RETURN
```



◀ drawn after each move, the newer version should only be drawn if the space bar is pressed.

The cube requires 27 different squares (only three sides) to be drawn on the screen, each with the correct colour or pattern contained within them.

The top left hand co-ordinate on the graphics grid of the square to be drawn is read from a data statement, the computer then draws the square (given the co-ordinate to start from). The contents of the array corresponding to that square are examined and depending on the code number, the correct colour is painted in the square.

Unfortunately, in the graphics mode that I have chosen only four colours can be used: green, yellow, blue and red (code numbers 1, 2, 3 and 4 respectively). If the code in the array is 5 or 6 a small square is drawn within the original square. This is painted blue or red respectively.

After the first nine squares have been drawn, the computer reads a different array and draws the appropriate shaped square. The same thing occurs after the next nine have been drawn, always painting the correct colour in the square, corresponding to the colour code.

Saving time

To save time repainting a square that is already painted the same colour, the computer tests a point within the square. If it is the correct colour to that which the code suggests, the computer will return to the main routine and go on to the next square.

To add interest to the game, a different sound is made each time a square is painted a different colour.

If the P key is pressed, the subroutine for saving one's position on tape is called. It simply asks the user to enter a tape and press record. After the user has told the computer the name of the data file, it automatically records the current contents of the arrays on to the tape.

At the beginning of the game, the user is asked if he wishes to continue with a saved cube. If he does he enters the tape and gives the name of the file. The arrays are then read off the tape in the same order as they were written. Once the space-bar is pressed, the cube is seen as it was and one can continue with it as before.

If you wish to retrace your previous moves, press the < key. Press the > key if you wish to move back towards the position when you entered the retracing mode. Press the ? key if you wish to leave this mode and continue your way towards solving the cube.

Memorising moves for retracing is very simple. At the commencement of the game a string array is dimensioned to an appropriate size so it can memorise enough moves. After each key is pressed, other than the P and space bar (which are not actually moves), the letter is put into the next block of the $ array. The computer then returns to the main part of the program and swaps the other array's elements for each side over depending on the user's move. ■

The family favourites for your Dragon 32



NEW RELEASES

MYSTERY OF THE JAVA STAR: Four part (over 100K) educational adventure for the older child. 3 levels of difficulty. Packed with challenges, puzzles and information. £7.95

SHAPER: Comprehensive sound effect utility. Create, store and modify machine code sound effects, for use in your own programs. Comes with a store of 100 effects and a comprehensive manual. £9.95

NORTH SEA OIL: Simulation game. Run your own oil rig and see how fast you can make 100 million dollars! £5.75

PETTIGREWS DIARY: Epic 90K adventure for the whole family. Packed with features. £7.95
EMPIRE: Highly praised strategy game. £6.95
PUZZLER: Jigsaw puzzle game. 4 levels. £6.95
HOOKED: Entertaining fishing game. 1/2 players. . . £5.75
FUN TO LEARN: Menu based education for 6-12 year olds. £6.95
MONSTER MATHS: Menu based education for 8-14 year olds. £6.95
FAMILY PROGRAMS: Games/education/utilities. . . £6.95
FUN & GAMES: Games compendium for all ages. . . £6.95
LIVE & LEARN: Educational compendium for older children. £6.95
QUIZ PACK: Two quiz games. 500 words. £3.95
INFANT PACK: Pre-school education. Counting and alphabet. £3.95
JUNIOR PACK: Primary school education. £3.95

DEALERS! Phone us now on 01-514 4871 for our comprehensive catalogue

SHARDS Software

Available from selected branches of Boots and all good stockists, or by telephoning Access/Barclaycard orders to 01-514 4871 or by sending cheque/PO to: 189 ETON ROAD, ILFORD, ESSEX IG1 2UQ.

OM doesn't live here any more

***Pam D'Arcy** introduces the Basic shuffle*

THIS ARTICLE represents an in-store investigation to help you improve your own programming techniques, banish the OM error syndrome, and make the best use of available store. Out of a desperate need to make the most of the available memory in programs such as Dragon Data's Database, I offer you the fruits of my research which takes the guesswork out of allocating your data storage areas.

Dividing

I'll begin by dividing the Dragon's memory layout into five areas, A to E. A is the 1536 bytes reserved for running any Basic program. B is an optional area between zero and 12288 bytes which is reserved for up to eight graphics pages. When newly switched on, four pages (6144) bytes are reserved by default. Typing in PCLEAR1 will reduce this area to one page (1536 bytes). POKE25,6:NEW removes this last page (actually leaves one byte).

C is the actual Basic program — its size is dependent on program and user requirements (August's issue gave an insight into how Basic statements are held in store and the memory taken up). D, the memory available for data storage, is the subject of this article, while E is the nominal 1 byte reserved by Basic unless user written machine code subroutines are used.

In fact, Basic further subdivides area D between simple variable and array table pointer storage (which I will call area F) and string storage (G).

The size of area G is that of the last valid CLEAR statement issued. When first switched on, 200 bytes are reserved by default. RESET abides by the last valid CLEAR statement issued. CLEAR0 is valid. As its name suggests, this area is dedicated for use of string ($) variables.

Area F itself is further subdivided. Any used space commences at the lowest address (= end of program address + 2) and is used contiguously upwards, resulting in this arrangement: simple variables (H), array pointer tables (I), unused space (J). The size of area J is, except for a few further bytes reserved by Basic, what is returned as the MEM value at any one time.

Thus when first switched on, the map of areas A to J is as shown in *Diagram 1*, with MEM (= available J area) giving you 24871 bytes. CLEAR0 reduces G to nil. POKE25,6:NEW reduces B to 1; sets start value of C to 1537. MEM will now give you 31215 bytes.

To go back to area F. Simple variables are any variables that are referred to without a subscript. Arrays are any variables referenced with subscripts.

Thus if a program refers to a variable A$ and a variable A$(0), two quite separate locations would be used by Basic when storing information in those fields, a simple variable location and the other referenced via the array pointer table. The simple variable and array table pointer areas are extended as each new variable is encountered during program execution.

Each item has a specific layout as touched upon in the August issue — see *Diagram 2*. The address of the string will point to a location in the Basic program (eg A$ = "FIELD NAME" then Basic doesn't waste space by copying "FIELD NAME" to a location in the string stack but instead points the variable directly to its occurrence in the program area, generally referred to a "preset" data). Or it will point to a location in the string stack (eg INPUT # −1,A$ sets the data read off the file in the string stack and the simple variable storage points to this location).

Array pointer table storage is arranged per named array as seven bytes overhead plus per subscript item (including 0) five bytes, eg DIMAA$(4) takes up 7 + (5 × 5) = 32 bytes. The five bytes per item are laid out as bytes two to six of the simple variable storage shown in *Diagram 3*.

If Basic encounters a subscripted variable that has not been the subject of a previously encountered DIM statement, it automatically sets up an array pointer table assuming 11 entries (ie DIM varname(10)).

Shuffler

Basic is a better shuffler than any card sharp could be. As mentioned above, the simple variable and array pointer table storage area is used contiguously from the lowest address, simple variables preceding arrays.

Thus if an array is defined with simple variables not appearing in earlier DIM statements, every time that Basic encounters a new simple variable, the array pointer tables are shuffled along to accommodate the new simple variable. For example:

```
100  DIMA$(1000)
  "
  "
  "
1300  FOR V = 1 TO 1500:NET V:REM
        TIME DELAY
1320  FOR D = 1 TO 6
1340  A$(D) = A$(D + 1)
1360  NEXT D
```

then the pointer table for the only array (A$) would be set up at the lowest available address. When the variable V is encountered for the first time during execution, the array pointer table is moved along seven bytes to accommodate the new simple variable. When the variable D is encountered for the first time, the arrays are moved on a further seven bytes etc. ▶

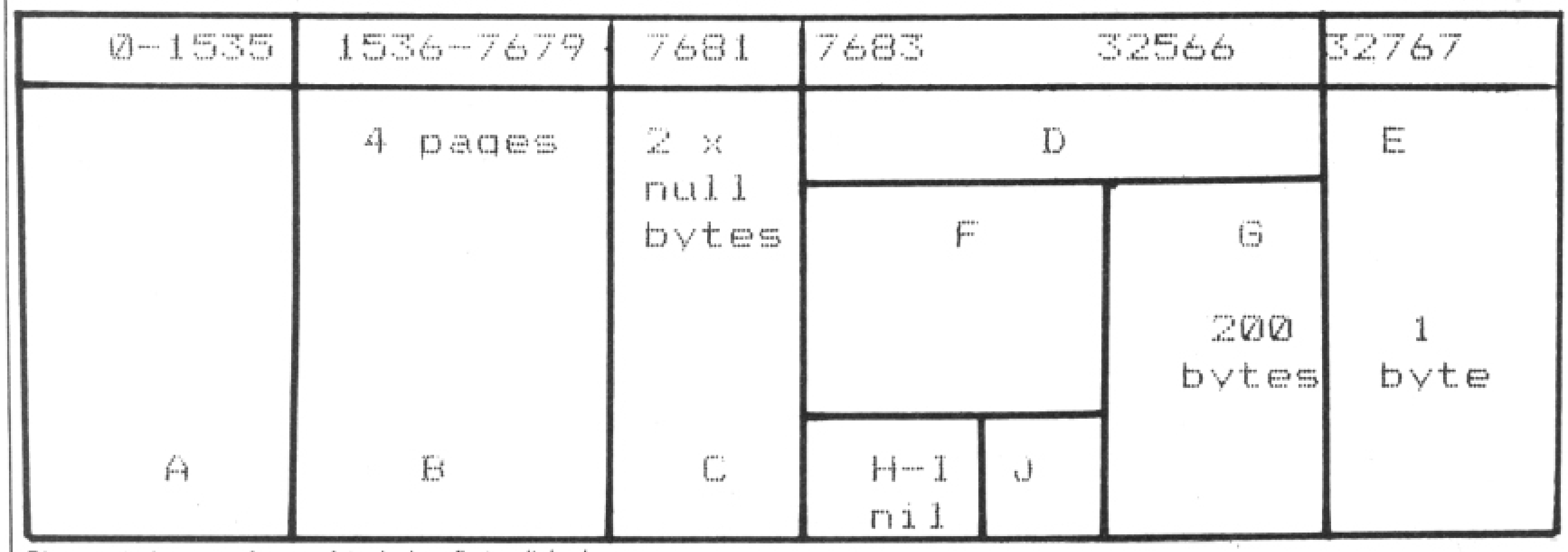
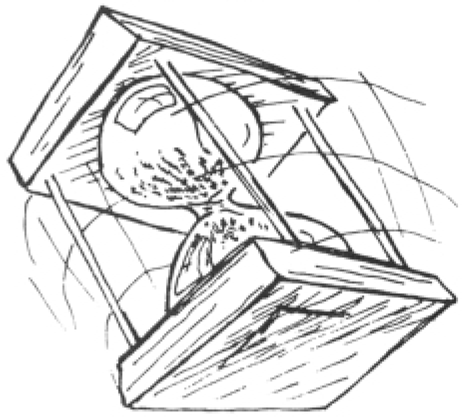


Diagram 1: the map of areas A to J when first switched on

SUPERIOR SO

EDIT+



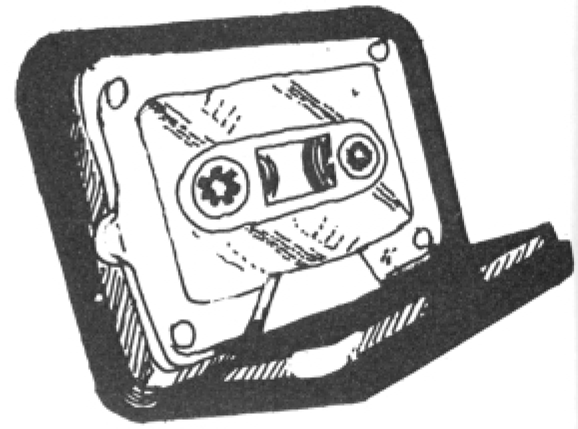
* EDIT+ is a Full Screen Editor and Programmer's Tool Kit. It's an excellent aid for writing programs in BASIC and is easy to use for the novice as well as the experienced programmer. EDIT+ includes all the facilities of HI-RES. Up to 23 lines of your program are displayed on the screen and can be changed by overtyping, inserting, or deleting characters. Functions include: Find String, Change String, Copy Text, Goto Specified Line, Scroll Up Down, Append From Tape and Enter Basic Command. No Dragon is complete without an EDIT+. £34.50

HI-RES



* Plug the HI-RES cartridge into your DRAGON and you will immediately see the improvement. The screen displays 24 rows of 51 characters with proper lower case and BASIC works as normal but with extra features: Selectable character sets (English, French, German, Danish, Swedish, Italian, Spanish). SPRITE Graphics. Redefinable Characters. Improved keyboard action with autorepeat allows faster typing. Graphics and text can be mixed on the screen. Suitable for educational and business use. £25.30

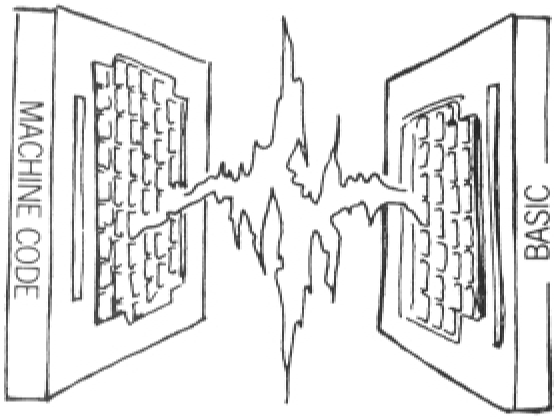
SOURCE TAPES



The following programs contain both source and object code. They can be used in conjunction with 'DASM' or on their own as individual programmes. It's a great way to build up your software library. Each tape represents excellent value at only £5.99 each.

1. DISASSEMBLER
2. GAME OF LIFE
3. HI-RES SCREEN DUMP FOR EPSON
4. HI-RES SCREEN DUMP FOR SEIKOSHA

DASM



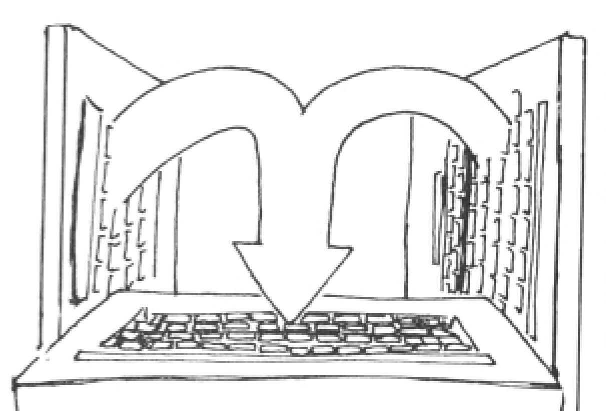
DASM is a versatile assembler, designed especially for ease of use on the DRAGON and allows you to assemble machine code while still retaining the full use of BASIC. Supports all 6809 instructions and modes. Allows any length for labels (the first 5 and the last characters are used). Full support for output to printer. Recommended for the beginner. £18.95

DEMON



A powerful machine code monitor which allows you to delve into the internals of your DRAGON as well as helping you to debug your machine code programs (and BASIC programs using PEEK and POKE). Includes: Examine/Change memory, Examine/Change registers, Print Screen, Set Breakpoints, Test Memory. An essential tool for all machine code users. £18.95

DASM/DEMON

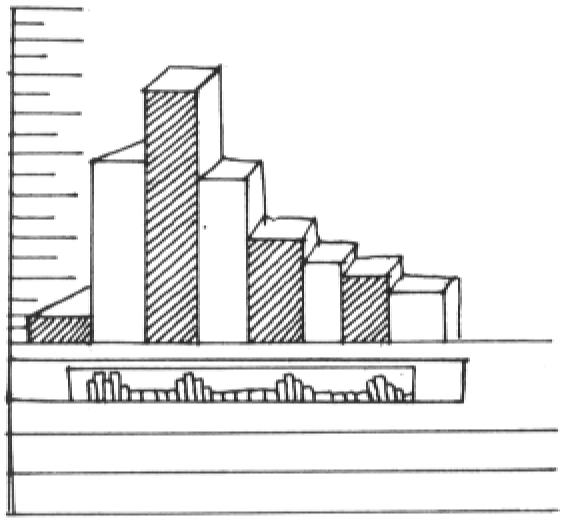


* It has all the features of both DASM and DEMON in one package. DEMON is the natural-partner to DASM, complementing each other perfectly. Write, test and use your programs without the bother of reloading. It is extensively featured in the new book by Ian Sinclair on Dragon Machine Code. It is the ideal combination for the machine code user. £30.45

VISIT YOUR NEAREST STOCKIST OR FOR FAST MAIL ORDER SERVICE

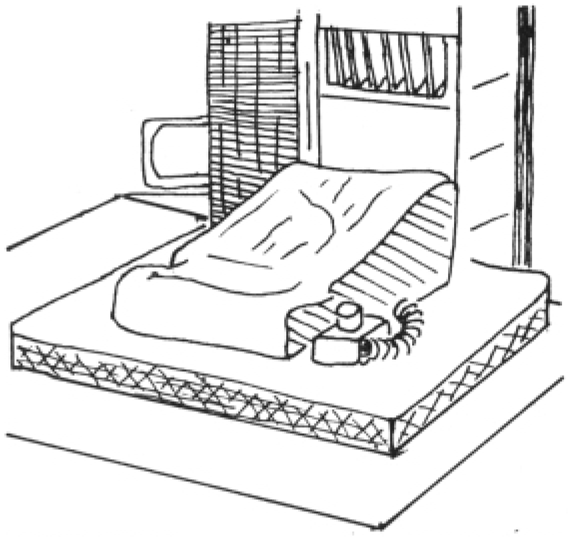
FTWARE

GRAPH DRAWER



For HI-RES or EDIT+, draws bar charts direct to screen and printer. Print module for Epson MX or FX printer included. Introductory offer of £14.95 if purchased with HI-RES or EDIT. £19.95

EXTRAS

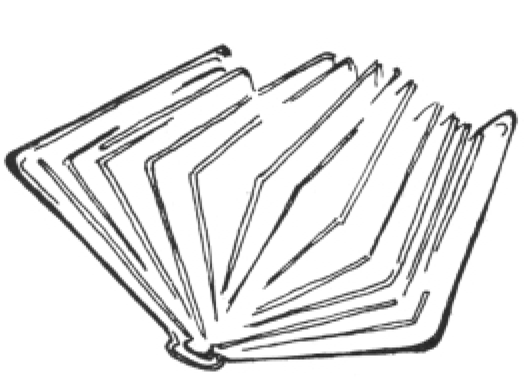


DUST COVER	inc P&P £2.99
PRINTER LEAD	inc P&P £14.95
MONITOR/SOUND LEAD	inc P&P £3.99

Super inexpensive 14 inch Colour Monitor with integral sound ideal for DRAGON and most other applications only £225.00

DRAGON DISC DRIVE complete inc P&P £269.00

BOOKS

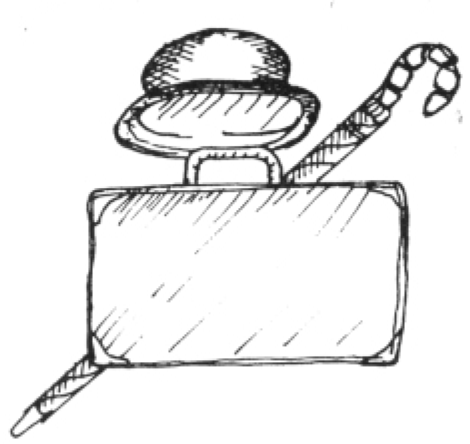


Books and Extras

Introducing Dragon Machine Code by Ian Sinclair	£7.95
Advanced Sound and Graphics	£5.95
The Working Dragon 32	£5.95
Programming the 6809 Zaks	£12.50
6809 Assembly Language Prog. Leventhal	£12.50

Postage on books: 50p per book except Zaks/Leventhal £1 maximum £1.50

BUSINESS SOFTWARE



The following MST programs are now available for use on cassette with the HI-RES 51 by 24 Screen: Database, Business Accounts, Stock Control, Invoices/Statements, Mailer/Address Book.

Also available: Home Accounts, MST Calc. £19.95

CONTACT COMPUSENSE (Please add 50p p&p per order)

BEDFORD
Software Centre, 52a Bromham Road (0234) 44733

BIRMINGHAM
The Gamekeeper, Grandfare Superstore, 1st Floor, 224 High Street, Erdington (021) 3846108

BRISTOL
Brensal Computers Ltd., 24 Park Row (0272) 294188

DERBYSHIRE
Dragon Dungeon, Milton House, St. John's Street, Ashbourne (0335) 42529
First Byte Computers, 10 Main Centre, London Road, Derby (0332) 365280

DORSET
Games & Computers, 31 North Street, Wareham (09295) 51383

ESSEX
The Serious Users Software Centre, At Bolingbroke & Wenley, High Street, Chelmsford (94) 58771

HAMPSHIRE
Commercial & General Typewriter Co., 165 Lynchford Road, Farnborough (0252) 540125

HERTFORDSHIRE
D.J. Computers, 11 Town Square, Stevenage (0438) 65501

IRELAND
Data Bank, Nagor House, Dundrum Road, Dublin (0001) 988284

KENT
Medway Computers, 141 New Road, Chatham (0634) 826080
Modata Computer Ltd., 30 St. John's Road, Tunbridge Wells (0892) 41555

LANCASHIRE
Elkan Electronics, 11 Bury New Road, Prestwich, Manchester (061) 7987613
Home Computers, 234 Church Street, Blackpool (0253) 22340

LONDON
Buffer Micro Shop, 310 Streatham High Road, S.W.16 (01) 769 2887
Stirling Micro Systems Ltd., 241 Baker Street, N.W.1 (01) 486 7671

MIDDLESEX
Enfield Communications, 135 High Street, Ponders End (01) 805 7434

NORTHERN IRELAND
M.K.M. Electronics Ltd., 25 Antrim Street, Lisburn, Co. Antrim (084 62) 3184

NOTTINGHAM
Computer Market, 27 Goosegate, Hockley (0602) 586454

SCOTLAND
Livingston Computer Centre, 17 The Mall, Livingston, West Lothian (0506) 36978

SURREY
Computasolve Ltd., 8 Central Parade, St. Marks Hill, Surbiton (01) 390 5135
Statacom Ltd., 234 High Street, Sutton (01) 661 2266

SUSSEX
Gamer, 24 Gloucester Road, Brighton (0273) 698424

WALES
AberData Ltd., (at Galloways) 23 Pier Street, Aberystwyth, Dyfed (0970) 615522

WEST MIDLANDS
Progressive Computers, Marsh Street, Walsall (0922) 640593

YORKSHIRE
Comprite Ltd., Thorite House, Laisterdyke, Bradford (0274) 668890

INTERNATIONAL

CANADA
Dragon Data (Canada) Ltd., 130 Adelaide Street West, Suite 1820, TORONTO (416) 947 9052

ISRAEL
The Computer (Nachmani Comfort) Ltd., 5 Halpern Street, Tel-Aviv (03) 230648

NORWAY
Informasjionssytemer as, Skippergt, Boks 342, Oslow (02) 501080

*Available at selected branches of Boots.

COMPUSENSE LIMITED
Box 169, 186D Green Lanes, Palmers Green, London N13 4HT 01-882 0681/6936 24hr.
Telex: 8813271 GECOMS G

NEW FROM MICRODEAL

TELE-FORTH

A Step up from Basic

TELE-FORTH FOR THE DRAGON 32 a new high level language for the DRAGON 32

Tele-forth, a figForth Compiler has an execution as much as 10 to 20 times faster than Basic which makes for faster programming, highly modular for easy testing and de-bugging TELE-FORTH has been especially customised for the THE DRAGON 32, and is a full figForth implementation with added words to give the ease and use of a full screen editor with extra structuring statements (case etc.), Auto keyboard repeat together with full cassette and printer handling. *Microdeal Tele-forth comes complete with its 30 page tutorial to guide you through the basics of the Forth language.*

Selected Microdeal programs available from larger branches of Boots

AVAILABLE FROM DRAGON 32 DEALERS NATIONWIDE or direct from

MICRODEAL LTD.
41 Truro Road, St. Austell, Cornwall PL25 5JE.
24 hour orderline: 0726 3456

£19.95 includes post & packing

Access VISA AMERICAN EXPRESS

Send 1st Class stamp for our new catalogue for the Dragon 32



bytes	0 1	2	3	4 5	6
Strings	2 char. name, 2nd. char+$80 (=$ see Aug's)	curr. len. of the string content	null	address of string content	null
Numerics	2 char. name	actual value in exponential format			

Diagram 2: each item has a specific layout

0 1	2 3	4	5 6
2 char. name as above	Total len. of this array	$01	highest subscript +1 (i.e. actual num of items)

Diagram 3: simple variable storage

◀ The string stack is used in the opposite direction, ie from the highest address down. Any time that a string variable is adjusted, a new string stack location is set up (again, see August's issue). Although if it was previously a string contained in the stack, the old content remains there. However, when Basic encounters insufficient space in the stack for further new values, it "cleans up" the string stack, discarding redundant data and "shuffling together" currently active data in order to reuse the formerly redundant area.

The implications should now be becoming clear. OM may occur during a program when executing a CLEAR, executing a DIM, or coming across a new variable even well into processing.

If *all* variables are presented to Basic in DIM statements following the CLEAR, OM will not occur in the middle of a program run, as the maximum required data storage area will have been satisfactorily allocated prior to entering the main processing routines.

If simple variables are presented before array variables, it avoids wasting processor time in shuffling up array pointer tables to accommodate newly encountered simple variables. If array variables are DIMmed to their required size, space is not wasted on small arrays by the IO default.

We should now know enough about balancing arrays versus string space to take the guesswork out of the amount to CLEAR, the number of records our programs can accommodate, etc.

Having switched on the machine and decided whether or not to use the POKE25,6:NEW combination, CLOAD the program. If not using the POKE25,6, PCLEAR as appropriate (ie the same as the PCLEAR in your program if you are using one). CLEAR0:?MEM to discover the total amount of space this version of the program has available for data storage. Discount a certain amount for simple variables (if they are DIMmed, it is a simple task to count them up and multiply by the seven byte length each occupies). Discount a further 150 bytes of "workspace" for the Basic interpreter.

Knowing that each array used has an overhead of seven bytes plus five bytes per possible subscript (not forgetting zero), the amount of planned array pointer storage can now be calculated, leaving you with a valid CLEAR figure. Seeing how much space you have for string storage is where you then need, if necessary, to juggle between your requirements of array space (ie number of records you can cope with in any one run) and string space (ie actual string data storage).

But if you have followed the reasoning of this article, you can see that you can now plan with confidence, avoiding OM errors and maximising the use of available memory on other than a trial and error basis — as I had previously employed.

Gills

Unfortunately, avoiding OM errors will not make the program foolproof against OS errors if you try and fill it absolutely to its gills or if your "average" record size has been exceeded on this occasion. I have thoughts on getting over this problem without losing the data — but perhaps that had better be discussed in another article, not now.

A practical way to illustrate the points made here is with the Database program from Dragon Data — which is on the Dragon Special Selection 2 cassette.

I find this program quite useful for different things and have standardised my own program data file formats to its format in order to benefit from its facilities. However, following the instructions supplied, I find 200 records restrictive for the type of files that I want to hold — and if you follow the given advice on increasing this to 500, the dreaded OM occurs.

The program contains no PCLEAR statement, so having switched on the machine and loaded the program, MEM is 17652. Add the 200 bytes already CLEARed by default so 17852 bytes of storage are available for data storage as the program stands.

Three of the program lines are:

```
110 CLEAR14000
"
"
130 M = 200
"
"
180 DIM A$(M),FT$(10),AA(M + 1)
```

M = the number of data items allowed in the database (= 200 × 1 field records: 100 × 2 field records etc).

Roughly, there seems to be less than 100 bytes of simple variable storage required. The fixed size array table (FT$(10)) requires 7 + (11 ⋆ 5) = 62 bytes. Therefore 17852 − 162 leaves just under 17700 bytes to balance the number of records versus string space.

Following the instructions regarding amending the M value to 500, resulting in a database of 500 records × 28 characters (= 14000 bytes cleared — the way I would have approached it too, before understanding the storage set up):

A$(M) array requires 7 + (501 ⋆ 5) =	2512
AA(M + 1) requires 7 + (502 ⋆ 5) =	2517
Total bytes =	5029

CLEAR14000 + A$ and AA array storage 5029 = 19429 bytes.

Not surprising that with only 17700 bytes at our disposal, an OM error occurs. PCLEAR1 before RUN would easily resolve this.

Database can be tailored to one's own needs. Take a requirement of two fields per database record: field one averages 64 characters, field two averages five, giving a total of 69. There are the two arrays per item, so 2 × 2 fields × 5 bytes (per array item) = 20 characters — or 89 characters per record.

With PCLEAR1, 22460 bytes are available for data storage. Being generous by leaving the odd 360 bytes for Basic, other variables and FT$(10), leaves space for 22100 / 89 = 248.3 records. Thus, the A$ and AA array space for 250 (0 to 249) records would require:

	bytes
A$ 248 records ⋆ 2 items ⋆ 5 =	2480
AA 249 records ⋆ 2 items ⋆ 5 =	2490
Sub-total =	4970
Plus array overheads 2 ⋆ 7 =	14
Total =	4984

Thus 22100 − 4984 = 17116 bytes are available for CLEAR, while 17116 bytes / 247 usable records = average string size per record of 69.3 characters. This reflects very reasonably on the commencing requirements, not forgetting that some string storage space will be needed for field titles, keyboard input and other bits and pieces.

The possible database of 247 × 2 field records averaging 69 characters per record is a far more attractive proposition than at first seems possible from the accompanying literature. However, despite the usefulness of the Database program, I have in fact developed a complementary program to make up for its deficiencies in some areas, notably record editing, merging of files and inserting records in the middle of unsortable files. It is available from Pamcomms Ltd, 21 Wycombe Lane, Wooburn Green, High Wycombe, Bucks, price £3. ■

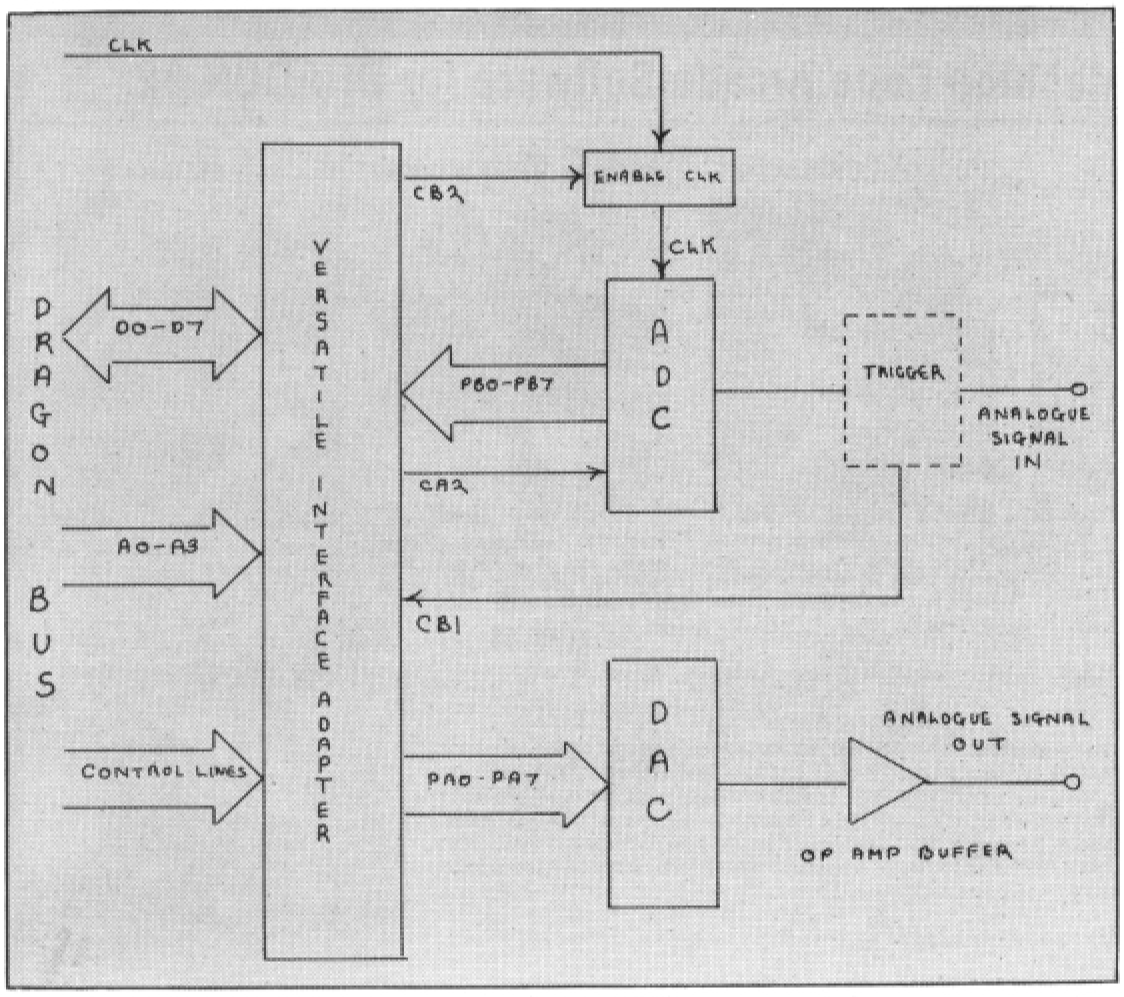


Figure 1 – analogue/digital interface shown as a block diagram

Program 1

```
10 REM************PROGRAM III**********
20 '
30 REM***********DRAGON SCOPE**********
40 '
50 REM****INITIALISE****
60 CLEAR 2000,&H7000:F=0:M=0:S=0:PMODE4,1:PCLS1:COLOR0,1
70 DATA &H86,&HFF,&HC6,&H00,&HB7,&HFF,&H43,&HF7,&HFF,&H42,&H86,&HEB,&HB7,&HFF,&H4C,&H39,&HB6,&HFF,&H40,&H86,&H10,&HB5,&HFF,&H4D,&H27,&HFB,&H8E,&H70,&H01,&HC6,&HFF,&H86,&HEB,&HB7,&HFF,&H4C,&HB7,&HFF,&H41,&H86,&HCF
80 '
90 DATA &HB7,&HFF,&H4C,&H12,&H12,&H12,&H12,&H12,&H12,&HB6,&HFF,&H40,&HA7,&H80,&H5A,&H26,&HE5,&H86,&HFF,&HB7,&HFF,&H4C,&H39,&HB6,&HFF,&H40,&H86,&H10,&HB5,&HFF,&H4D,&H27,&HFB,&H8E,&H70,&H01,&HC6,&HFF,&H86,&HEB,&HB7,&HFF,&H4C
100 '
110 DATA &HB7,&HFF,&H41,&H86,&HCF,&HB7,&HFF,&H4C,&H12,&H12,&H12,&H12,&H12,&H12,&HB6,&HFF,&H40,&HA7,&H80,&H10,&HBE,&H7F,&HF1,&H31,&H3F,&H26,&HFC,&H5A,&H26,&HDD,&H86,&HFF,&HB7,&HFF,&H4C,&H39
120 DATA &H8E,&H70,&H01,&HC6,&HFF,&HF7,&HFF,&H43,&HA6,&H80,&HB7,&HFF,&H41,&H10,&HBE,&H7F,&HF1,&H31,&H3F,&H26,&HFC,&H5A,&H26,&HF0,&H39
130 '
140 FORI=0 TO 144:READ B
150 POKE&H7101+I,B:NEXT
160 '
170 REM****INITIALISE 6522 VIA****
180 EXEC &H7101
190 '
200 REM****TITLE & OPTIONS****
210 CLS:PRINT@166,STRING$(20,"*"):PRINT@230,"DRAGON STORAGE SCOPE":PRINT@294,STRING$(20,"*")
220 TIMER=0
230 IF TIMER<250 THEN 230
240 CLS:PRINT@43,"OPTIONS":PRINT@75,STRING$(7,"*")
250 PRINT@129,"1. FAST TIMEBASE.APPROX 13 MS"
260 PRINT@193,"2. MEDIUM TIMEBASE 16-17000 MS"
270 PRINT@257,"3. SLOW TIMEBASE>17000MS"
280 PRINT@321,"4. EXPAND TRACE"
290 PRINT@385,"5. OUTPUT DATA TO DAC CONVERTOR"
300 I$="12345"
310 A$=INKEY$:IF A$<>"1" AND A$<>"2" AND A$<>"3" AND A$<>"4" AND A$<>"5" THEN 310
320 N=INSTR(I$,A$)
330 ON N GOSUB 370,460,550,630,740
340 GOTO 240
350 '
360 REM****FAST TIMEBASE****
370 CLS:PRINT@41,"FAST TIMEBASE":PRINT@73,STRING$(14,"*"):GOSUB 1900
380 J$="12":A=13
390 A$=INKEY$:IF A$<>"1" AND A$<>"2" THEN 390
400 F=INSTR(J$,A$):GOSUB 1560
410 ON F GOSUB 970,970
420 F=0
430 RETURN
440 '
450 REM****MEDIUM TIMEBASE****
460 CLS:PRINT@40,"MEDIUM TIMEBASE":PRINT@72,STRING$(16,"*"):GOSUB 1900
470 J$="12"
480 A$=INKEY$:IF A$<>"1" AND A$<>"2" THEN 480
490 M=INSTR(J$,A$):GOSUB 860
500 ON M GOSUB 970,970
510 M=0
```

Adding more scope

***A G Nanson** moves on to explain applications for the interface which was introduced last month*

NUMEROUS applications of the analogue/digital interface described last month will undoubtedly suggest themselves to the interested user, but one which is quite interesting is its use to convert the Dragon 32 into a simple storage oscilloscope.

Briefly the mode of operation is as follows. Under software control the ZN427 ADC samples the incoming analogue signal 256 times. The values representing these samples are stored in a table 256 bytes in length starting at address &H7001. Then by means of suitable software a graphical representation of the original analogue signal is drawn on the Dragon graphics screen, where it may be examined at leisure. A simple "time-base" effect is produced by interposing a variable software delay between each successive sample of the analogue signal (it should also be possible to utilise the 6522 timers to effect this delay). The longer the delay the slower the "time-base". Note that the delay is fixed in the case of the "fast time-base" to give a trace approximately 13 milliseconds in length.

As a guide to how the storage scope may be implemented, see *Programs I* and *II*. Program I is the main program and II is an assembly listing of its machine code portion.

Trigger

The box marked "trigger" in *Figure 1* (shown in detail in *Figure 2*) is used in conjunction with the storage scope program (care must be taken when handling the CD 40106 as it may be damaged by static electricity). By choosing the trigger option the ADC will not commence its conversion cycle until the incoming signal activates the trigger circuit. Thus it is possible to examine transient wave forms or non-repetitive events. A means of adjusting the level at which the incoming signal will trigger the ADC is provided.

Lines 60-180 in program I reserve memory, load the 6809 op codes contained in the data statements, and initialise the 6522 VIA. The user is then presented with five options. These are three "time-base" speeds, a simple trace expansion facility and output data to the DAC. After choosing a time-base speed the user is presented with the trigger option, together with information on preserving or clearing the trace before returning to the main option.

```
520 RETURN
530 '
540 REM****SLOW TIME BASE****
550 CLS:PRINT@42,"SLOW TIMEBASE":PRINT@74,STRING$(13,"*"):GOSUB 1900
560 J$="12"
570  A$=INKEY$:IF A$<>"1" AND A$<>"2" THEN 570
580 S=INSTR(J$,A$):GOSUB 860
590 ON S GOSUB 1050,1050
600 S=0
610 RETURN
620 REM***EXPAND TRACE OPTION***
630 CLS:PRINT@43,"EXPAND TRACE":PRINT@75,STRING$(12,"*")
640 PRINT@129,"1. EXPAND TRACE"
650 PRINT@225,"2. TO RETURN TO OPTIONS PRESS"
660 PRINT@292,"'R'.TO CLEAR SCREEN BEFORE"
670 PRINT@356,"RETURNING TO OPTIONS PRESS"
680 PRINT@420,"'C':AFTER COMPLETION OF SCAN"
690 A$=INKEY$:IF A$<>"1" THEN 690
700 GOSUB 1680
710 RETURN
720 '
730 REM****DAC OPTION****
740 CLS:PRINT@33,"OUTPUT DATA TO DAC CONVERTER"
750 PRINT@66,STRING$(28,"*")
760 PRINT@129,"1. OUTPUT 256 BYTES OF DATA"
770 PRINT@196,"TO ZN426 DIGITAL TO ANALOGUE"
780 PRINT@260,"CONVERTER"
790 PRINT@321,"TO RETURN TO OPTIONS PRESS"
800 PRINT@392,"'R'.AFTER COMPLETION."
810 A$=INKEY$:IF A$<>"1" THEN 810
820 GOSUB 1230
830 RETURN
840 '
850 REM****ENTER LENGTH OF TRACE****
860 CLS
870 PRINT@34,"ENTER LENGTH OF TRACE IN MS"
880 PRINT:INPUT A
890 IF A<16 THEN 880
900 GOSUB 1570
910 N=(A*1000)/256:LN=ABS(INT((N-65)/8))
920 H=INT(LN/256):L=LN-(H*256)
930 POKE &H7FF1,H:POKE &H7FF2,L                    940 RETURN
950 '
960 REM****TO TRIGGER OR NOT TO TRIGGER****
970 IF F=1 AND M=0 THEN EXEC &H7111 ELSE IF F=2 AND M=0 THEN EXEC &H711B
980 IF F=0 AND M=1 THEN EXEC &H7141 ELSE IF F=0 AND M=2 THEN EXEC &H714B
990 SCREEN 1,0:GOSUB 1510
1000 A$=INKEY$:IF A$<>"C" AND A$<>"R" THEN 1000
1010 IF A$="R" THEN SCREEN 0,1:RETURN
1020 IF A$="C" THEN PCLS:SCREEN0,1:GOSUB 1400:RETURN
1030 '
1040 REM****SLOW TIMEBASE BASIC DRIVER****
1050 IF S=1 THEN 1080
1060 IF S=2 THEN Z=PEEK(&HFF40)
1070 IF PEEK(&HFF4D) AND &H10=&H10 THEN 1080 ELSE 1070
1080 D=INT(A/(256*20)+.5)
1090 FOR X=0 TO 255
1100 POKE&HFF4C,&HEB
1110 POKE&HFF41,0
1120 POKE&HFF4C,&HEF
1130 POKE(&H7001+X),PEEK(&HFF40)
1140 TIMER=0
1150 IF TIMER<D THEN 1150
1160 NEXT:POKE&HFF4C,&HFF
1170 SCREEN1,0:GOSUB 1510
1180 A$=INKEY$:IF A$<>"C" AND A$<>"R" THEN 1180
1190 IF A$="R" THEN SCREEN 0,1:GOSUB 1400:RETURN
1200 IF A$="C" THEN PCLS:SCREEN 0,1:RETURN
1210 '
1220 REM***OUTPUT DATA TO DAC****
1230 CLS:ND=1
1240 PRINT@36,"ENTER DELAY BETWEEN BYTES"
1250 PRINT:INPUT A
1260 '
1270 REM****CALCULATE AND ENTER DELAY***
1280 GOSUB 910
1290 '
1300 REM***OUTPUT DATA***
1310 EXEC &H7179
1320 REM****PRINT OUT DAC VALUES TO VDU***
1330 FOR XD=0 TO 255
1340 PRINT," ",ND+XD,"  ",HEX$(&H7001+XD),"  ",HEX$(PEEK(&H7001+XD))
1350 TIMER=0
1360 IF TIMER<50 THEN 1360
1370 NEXT:RETURN
1380 '
1390 REM****DRAW SCALES****
1400 PMODE 4,1:COLOR 0,1
1410 LINE(00,96)-(255,96),PSET
1420 LINE(64,96)-(64,102),PSET
1430 LINE(128,96)-(128,102),PSET
1440 LINE(192,96)-(192,102),PSET
1450 LINE(1,00)-(1,192),PSET
1460 LINE(1,48)-(3,48),PSET
1470 LINE(1,144)-(3,144),PSET
1480 RETURN
1490 '
1500 REM****DRAW TRACE****
1510 FOR X=0 TO 255
1520 Y=ABS(192-(INT(PEEK(X+&H7001)*(192/256)+.5)+12*SH(2)))
1530 PSET(X,Y):GOSUB 1860:GOSUB 1640:X1=X:Y1=Y
1540 NEXT
1550 RETURN
1560 CLS:PRINT@41,"FAST TIMEBASE":PRINT@73,STRING$(14,"*")
1570 PRINT@162,"ENTER Y-SHIFT"
1580 PRINT:INPUT SH
```

Once the choice of trigger options has been decided, the trace length is requested (not for fast time-base) followed by the amount of Y-shift required.

Lines 870-940 calculate the trace length and in lines 970-980, depending upon the trigger option, the appropriate machine code routine is executed.

Lines 1400-1480, Lines1510-1550, Lines 1640-1650, Lines 1860-1870: The scales are drawn and the trace displayed

Pressing "R" preserves the trace and returns the program to the main options list. Pressing "C" clears the trace before returning to the main options list.

This expand trace requests the start and end of the section to be expanded and the amount of Y Shift required. Lines 1680-1800 expand and print the section of trace requested. The trace is expanded only in the X-axis direction. By a judicious choice of Y-Shift values, and using the "R" option it is possible to display both the original and expanded traces on the screen at the same time.

Lines 1230-1370 enables the user to output the data contained in the table to the ZN426 DAC. The rate at which the data is sent to the DAC is controlled by interposing a variable delay between each byte. Once the 256 bytes stored in table have been sent to the DAC, the hexadecimal values of the bytes and their locations are listed to the screen.

As mentioned, program II is an assembly listing of the various machine code routines required to drive the DAC and ADC. The routines are quite straightforward and should provide a guide for further elaboration and improvement.

The scope program may be tested by applying a 50 KHz 2.5V RMS signal to the bi-polar input terminals of the ADC. Choosing the medium time-base with a trace length of 80 MS, a curve depicting 4 cycles of AC should be displayed.

With a simple amplifier such as that shown in *Figure 3* it is possible to view the wave forms produced by various sounds, and also the voice. By connecting a suitable photo transistor or photo cell to the input of the amplifier, traces showing variations in light intensity can be obtained, eg on switching on a tungsten filament lamp, or a fluorescent light. The frequency response of the storage scope is limited to a few kilo-hertz, but even so, it should prove to be quite a useful tool.

A list of possible sources of technical data and literature is appended for any intending constructors. A courteous letter accompanied by a stamped, addressed envelope usually results in a satisfactory response in the case of technical data sheets. I obtained my Dragon 32 circuit diagram from Dragon Data, although whether this was a one-off or whether the circuit diagrams are readily available I do not know.

The TRS 80 Colour Computer Technical Reference Manual should be available from any Tandy Store. It is reasonably priced and packed with information, much of which is relevant to the Dragon 32. Data sheets on the ZN427 ADC and ZN426

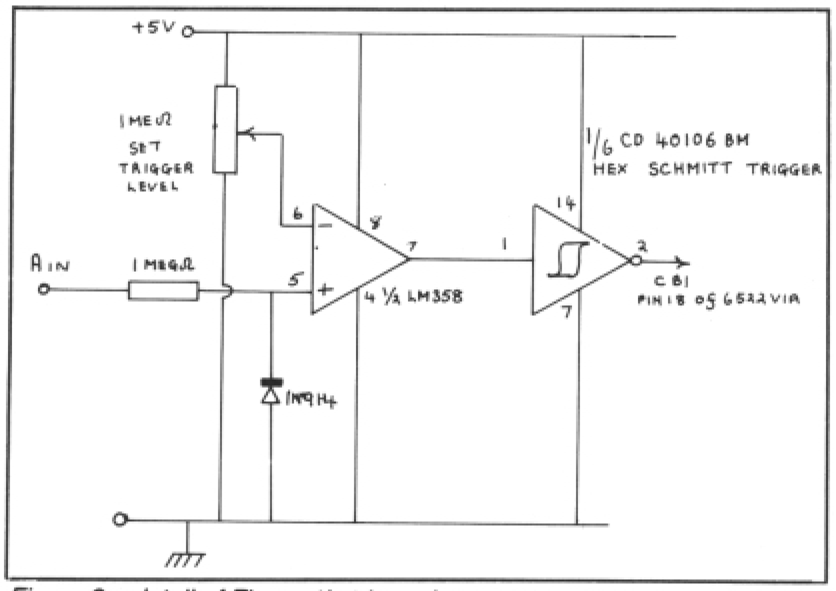


Figure 2 – detail of Figure 1's trigger box

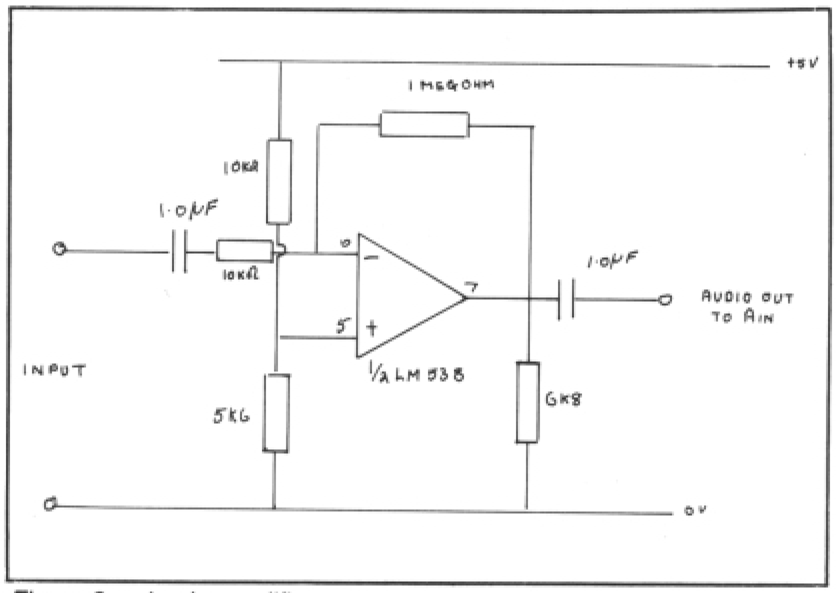


Figure 3 – simple amplifier

```
1590 X1=0
1600 GOSUB 1400
1610 RETURN
1620 '
1630 REM***JOIN INDIVIDUAL POINTS OF TRACE***
1640 LINE(X1,Y1)-(X,Y),PSET
1650 RETURN
1660 '
1670 REM***TRACE EXPANSION FACILITY***
1680 CLS:PRINT@43,"EXPAND TRACE"
1690 PRINT:INPUT"START OF SECTION";C
1700 PRINT:INPUT"END OF SECTION";E
1710 PRINT:INPUT"Y-SHIFT";SH:SCREEN1,1:GOSUB 1400
1720 X1=0
1730 NP=(INT((E-C)/4)+0.5)*4/256
1740 EX=INT(256/NP)+0.5
1750 I=0
1760 ST=INT(C*256/A)+0.5
1770 FOR X=0 TO 255 STEP EX
1780 Y=ABS(192-(INT(PEEK(&H7001+ST+K)*192/256+0.5)+SH*25))
1790 PSET(X,Y):GOSUB 1860:GOSUB 1640:X1=X:Y1=Y
1800 K=K+1:NEXT
1810 A$=INKEY$:IF A$<>"C" AND A$<>"R" THEN 1810
1820 IF A$="R" THEN SCREEN0,1:RETURN
1830 IF A$="C" THEN PCLS:SCREEN0,1:GOSUB 1400:RETURN
1840 '
1850 REM***STOP LINE COMMAND DRAWING OFF SCREEN***
1860 IF X=0 OR X>255 THEN X1=X:Y1=Y:RETURN
1870 IF X<0 OR X>255 THEN RETURN
1880 '
1890 REM***OPTIONS FOR EACH TIMEBASE***
1900 PRINT@129,"1. TRIGGER ON"
1910 PRINT@193,"2. TRIGGER OFF"
1920 PRINT@257,"TO RETURN TO OPTIONS PRESS"
1930 PRINT@323,"'R':TO CLEAR TRACE BEFORE"
1940 PRINT@388,"RETURNING TO OPTIONS PRESS"
1950 PRINT@452,"'C',AFTER COMPLETION OF SCAN":RETURN
```

DAC are obtainable from Ferranti Electronics, Fields New Road, Chatterton, Oldham, OL9 8NP.

For the MC6809E CPU MC6883 SAM, MC6847 VDG and MC6821 PIA try the European Literature Centre, Motorola Semiconductors, 88 Tanners Drive, Blakelands, Milton Keynes. And for the 6522 Versatile Interface Adapter try Synertek-Honeywell, Honeywell House, Charles Square, Bracknell, Berkshire, RG12 1EB; or Electronic Devices Division, Rockwell International, Heathrow House, Bath Road, Cranford, Middlesex.

Three useful books are *MC6809 MC6809E Microprocessor Programming Manual* which is published by Motorola and is obtainable from MacroMarketing, Burnham Lane, Slough, SL1 6LN; and *Micro-Processor Interfacing* and *Micro-processor Interfacing HandbookA/D & D/A* which are by Joseph J Carr, published by TAB Books Inc. These should be obtainable from any good computer bookshop. Photocopies of my previous article can be obtained by sending a stamped, addressed envelope to *Dragon User*. ■

Program 2

```
(C)COPYRIGHT COMPUSENSE LTD 1983 DASM 1.5
7001                30      ALL
7001                40 @START
7001                50 *
7001                60 * ******************************
7001                70 * DRAGON STORAGE SCOPE ROUTINES
7001                80 * ******************************
7001                90 *
7001               100 * SYSTEM EQUATES
7001               110 *
FF40               120 @VIABPR EQU $FF40   * VIA ORB/IRB REGISTERS
FF41               130 @VIAAPR EQU $FF41   * VIA ORA/IRA REGISTERS
FF42               140 @VIADRB EQU $FF42   * VIA DDRB
FF43               150 @VIADRA EQU $FF43   * VIA DDRA
AAFF4C             160 @VIAPCR EQU $FF4C   * VIA PCR
FF4D               170 @VIAIFR EQU $FF4D   * VIA IFR
7FF1               180 @MEMLOC1 EQU $7FF1  * STORE VARIABLE DELAY COUNTER
7FF2               190 @MEMLOC2 EQU $7FF2  *  "        "         "
7001               200 @TABLE RMB 256      * RESERVE TABLE 256 BYTES
7101               210 *
7101               220 * ******INITIALISE 6522 VIA*******
7101               230 *
7101 86FF          240      LDA #$FF
7103 C600          250      LDB #0
7105 B7FF43        260      STA @VIADRA          * INITIALISE ORA
7108 F7FF42        270      STB @VIADRB          * INITIALISE IRB
710B 86EB          280      LDA #$EB
710D B7FF4C        290      STA @VIAPCR          * INITIALISE PCR
7110 39            300      RTS
7111               310 *
7111               320 * *****FAST TIMEBASE ROUTINE*****
7111               330 *
7111 B6FF40        340 @FASTTRIG LDA @VIABPR * CLEAR IFR
7114 8610          350      LDA #$10
7116 B5FF4D        360 @WAIT1 BITA @VIAIFR   * WAIT FOR TRIGGER
7119 27FB          370      BEQ @WAIT1
711B 8E7001        380 @FAST LDX #@TABLE     * GET TABLE START
711E C6FF          390      LDB #$FF          * LOAD LOOP COUNTER
7120 86EB          400 @CONVER1 LDA #$EB     * DISABLE CLOCK
7122 B7FF4C        410      STA @VIAPCR       * "    "    "
7125 B7FF41        420      STA @VIAAPR       * SEND START CONV. PULSE
7128 86CF          430      LDA #$CF          * RE-ENABLE CLOCK
712A B7FF4C        440      STA @VIAPCR       * "    "    "
712D 12            450      NOP               * DELAY 2 CLK CYCLES
712E 12            460      NOP               *  "        "     "
712F 12            470      NOP               *  "        "     "
7130 12            480      NOP               *  "        "     "
7131 12            490      NOP               *  "        "     "
7132 12            500      NOP               *  "        "     "
7133 B6FF40        510      LDA @VIABPR       * READ ADC DATA
7136 A780          520      STA ,X+           * STORE DATA IN TABLE
7138 5A            530      DECB              * DEC LOOP COUNTER
7139 26E5          540      BNE @CONVER1      * UNTIL 256 SMPLS GOT
713B 86FF          550      LDA #$FF          * STOP CLK
713D B7FF4C        560      STA @VIAPCR       * "     "
7140 39            570      RTS               * RETURN TO BASIC
7141               580 *
7141               590 * ****MEDIUM TIMEBASE ROUTINE****
7141               600 *
7141 B6FF40        610 @MEDTRIG LDA @VIABPR
7144 8610          620      LDA #$10
7146 B5FF4D        630 @WAIT2 BITA @VIAIFR
7149 27FB          640      BEQ @WAIT2
714B 8E7001        650 @MEDSPD LDX #@TABLE
714E C6FF          660      LDB #$FF
7150 86EB          670 @CONVER2 LDA #$EB
7152 B7FF4C        680      STA @VIAPCR
7155 B7FF41        690      STA @VIAAPR
7158 86CF          700      LDA #$CF
715A B7FF4C        710      STA @VIAPCR
715D 12            720      NOP
715E 12            730      NOP
715F 12            740      NOP
7160 12            750      NOP
7161 12            760      NOP
7162 12            770      NOP
7163 B6FF40        780      LDA @VIABPR
7166 A780          790      STA ,X+
7168 10BE7FF1      800      LDY @MEMLOC1      * VARIABLE DELAY
716C 313F          810 @DELAY LEAY -1,Y      *  "     "      "
716E 26FC          820      BNE @DELAY        *  "     "      "
7170 5A            830      DECB
7171 26DD          840      BNE @CONVER2
7173 86FF          850      LDA #$FF
7175 B7FF4C        860      STA @VIAPCR
7178 39            870      RTS
7179               880 *
7179               890 * *****DAC ROUTINE*****
7179               900 *
7179 8E7001        910      LDX #@TABLE       * GET TABLE START
717C C6FF          920      LDB #$FF          * INITIALISE ORA
717E F7FF43        930      STB @VIADRA       *  "      "     "
7181 A680          940 @NEXTBYTE LDA ,X+     * GET DATA
7183 B7FF41        950      STA @VIAAPR       * DATA TO DAC
7186 10BE7FF1      960      LDY @MEMLOC1      * VARIABLE DELAY
718A 313F          970 @DELAY1 LEAY -1,Y     *  "      "      "
718C 26FC          980      BNE @DELAY1       *  "      "      "
718E 5A            990      DECB              * DEC LOOP COUNTER
718F 26F0         1000      BNE @NEXTBYTE     * UNTIL 256 BYTES OUT
7191 39           1010      RTS               * RETURN TO BASIC
7192              1020      END @START
```

The latest word on i/o routines

***John Botibol** puts the record straight on input/output*

INPUT/OUTPUT ROUTINES on the Dragon would seem an unlikely area for controversy, but the dust is only now settling following the publication of an article on the subject last year. Ian Nicholson's article was met by a series of letters which are still being received, with claims and counter-claims flying back and forth. Here I'll try to present a calmer appraisal of some of the areas of confusion.

Regular readers may benefit from referring to the July issue of *Dragon User* which contained the original article — and to the September and November issues for the subsequent correspondence.

I'll begin by looking at input/output locations and then consider exactly what an interrupt is. There are 32 memory locations set aside for future expansion. The SAM chip provides an enable (low) signal for the entire block. This is used in conjunction with the lower address lines to decode space for up to eight PIAs or any other such requirements as may be deemed necessary. There are also 16K bytes of memory in the cartridge space into which I/O can be mapped.

Valid

An interrupt itself (as usually found) is a means of stopping the CPU, by an external signal, in order that a service routine may be carried out. When a valid interrupt signal is received, the CPU will complete its current instruction cycle and then save either its set of registers or a part-set of registers before calling a routine from a fixed vector which is always the same for any 6809 processor. In the Dragon the interrupt vectors are remapped into the ROM area of memory by the SAM chip. The very nature of the word "interrupt" describes its function well. Software interrupts, although they save the registers and behave in a similar way to hardware interrupts, are not directly triggered by external signals but by polling in software.

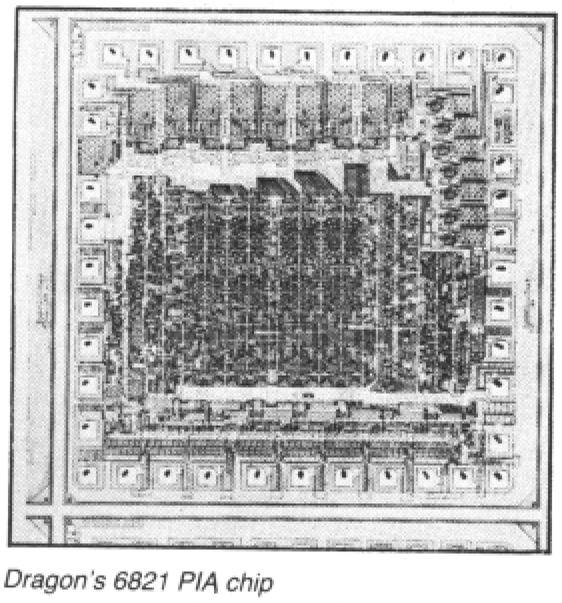
There are two major differences between CPU interrupt handling and PIA interrupt handling. First, CPU interrupts are enabled by setting the relevant CC flag low, while PIA interrupts are enabled by setting the relevant bit of the PIA control register high. Second, while a PIA interrupt *output* may be disabled, the input (if enabled) will still accept an interrupt input and will remember it by setting bit 6 or 7 of the control register. This means that interrupt inputs may be examined at the whim of the programmer, and conditional arguments may be used to determine the end result of the interrupt. A CPU interrupt fed directly to the CPU chip will not remember any interrupts which may have occurred while it was disabled.

The control lines (CA1, CA2, CB1, CB2) on a PIA may all be configured as inputs. However, CA2 and CB2 may also be programmed as output lines. All four lines have various modes of operation for strobing inputs and for handshaking purposes. CB1 is not an interrupt enable but an interrupt line which is programmed and enabled/disabled from the control register.

The joystick routines work by outputting a number on to the D/A converter and comparing the analogue voltage produced with the analogue voltage being generated by the relevant joystick potentiometer. The number output to the D/A converter is changed until the comparator changes its output, at which point the current value being input to the D/A converter may be taken as the joystick value.

The cassette relay is in no way connected with any interrupt routines. Neither is there such a thing as a printer relay. The cassette relay is operated by setting CA2 ($FF21) manually high. This line then operates a transistor switch which then drives the relay. Clearing bit 5 of the control register ($FF21), as suggested in the original article, will configure CA2 as an input line which makes little sense as the hardware requires it to be an output line in order to drive the relay.

Sound is not simply generated by feeding numbers to $FF20 as Ian suggested but by controlling the frequency of the program loop which is generating the sound. The value of the numbers which are used to generate the analogue output will relate to the volume of the output.



Dragon's 6821 PIA chip

And Bits 0,1 of $FF23 do not "indicate that a cartridge is present". As stated earlier in this article CA1 and CB1 may only be used as input lines. Bits 0,1 of the control register are used to configure the input line as required. Bit 0 is cleared to disable the interrupt input and set to enable it. Bit 1 is cleared to activate the interrupt flags on a high to low transition on the input line and is set to activate on a low to high transition. If Bit 0 is cleared and a valid signal was applied to, say, CA1, then Bit 7 of the control register will be set to indicate that an interrupt has been received. If Bit 0 was set, in the above situation, then not only would Bit 7 be set but the interrupt *output* from the PIA would also go low, thus providing a hardware interrupt to the CPU. This is how the cartridge initialisation works, since the interrupt output from the PIA is directly connected to the FIRQ input on the 6809.

Virtually

Finally (eventually!), with reference to Ian's letter of defence in the November issue, his short program would be very confusing to a novice as it is written in Z80 format rather than 6809! The instruction LDA ($FF21) is virtually meaningless as it indicates indirect addressing mode in 6809 terminology. The entire program makes little sense as any interrupt input to a PIA will set flags at Bits 6 and 7. Therefore, comparing the contents of $FF21 (even in extended addressing mode) with #$14 will prove nothing except that CA2 has been programmed as an input line and it will respond to a low to high transition, and that CA1 is disabled but will set the interrupt flag on a high to low transition on that line.

The correct program to switch on the relay is as follows:

```
        LDA     $FF21
        ORA     #$38
        STA     $FF21
```

and to switch off the relay:

```
        LDA     $FF21
        ANDA    #$F7
        STA     $FF21
```

To test the relay state, use the following:

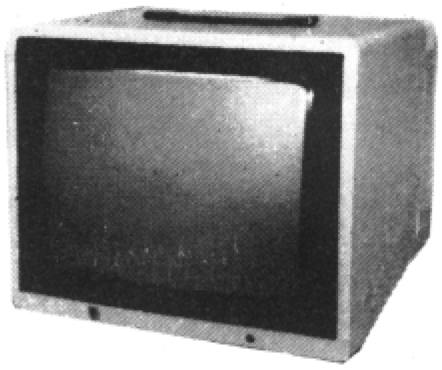
```
        LDA     $FF21
        ANDA    #$38
        CMPA    #$38
        BNE     RELOFF
        SWI
RELOFF  RTS
```

This will call the interrupt routine from SW1 vector when the relay is on. IRQA could not conceivably switch on a relay as it is connected to the Dragon's FIRQ pin.

In conclusion, may I suggest that anyone interested in this subject should obtain a suitable reference book on programming the 6821 PIA, and also the manufacturer's data sheet. These should provide the necessary information to enable users to complete their understanding of the subject. ■

A VERSATILE 14" COLOUR MONITOR *(WITH SOUND)* FOR YOUR DRAGON

A JLC COLOUR MONITOR WILL:



- ★ provide vastly improved display clarity and performance for clearer, crisper images
- ★ be a neat, compact and professional product that represents remarkably good value for money
- ★ have adaptability with a simple input connection switch for your Dragon c. video input or any RGB input
- ★ be compatible with all popular micros, video recorders, viewdata adapters and cameras
- ★ be designed and made in England
- ★ Fully guaranteed
- ★ Money back if not completely satisfied

Model 3373FCSM with CV/RGB and sound inputs

SPECIAL PROMOTION

SPECIAL PROMOTION
ONLY £199 INC VAT AND LEADS

(P&P £8 UK Mainland)
Collection no problem

Available from Direct Electronic Displays, Unit 7, 551A High Rd, London N17 Tel: 01-808 8847

SHARDS proudly introduce for the Dragon 32

"The Mystery of the Java Star"

THIS IS AN EDUCATIONAL ADVENTURE OF EPIC PROPORTIONS

Taking up over 100K of memory, including 80K of high resolution graphics, and loading in four parts, this adventure is designed to provide hours of family fun, filled with puzzles, challenges and interesting facts. Also, with three levels of difficulty and a score sheet at the end, this is a game you can play again and again, to try and beat your last score.

You have discovered an old map and a ship's log book, indicating the existence of magnificent treasures, including a mysterious ruby, the Java Star, aboard an 18th-century sailing ship, that sank in the Caribbean. You must mount an expedition, gathering all the necessary information, then search for the shipwreck and the hidden treasure. Many skills are needed to solve this mystery, making it the ideal adventure for friends or family to play together.

ALL THIS FOR ONLY £7.95

AVAILABLE NOW AT ALL GOOD STOCKISTS OR BY PHONING THROUGH YOUR ACCESS/BARCLAYCARD ORDER TO 01-514 4871 OR BY SENDING A CHEQUE/PO FOR £7.95 TO SHARDS SOFTWARE, 189 ETON ROAD, ILFORD, ESSEX IG1 2UQ

SHARDS Software

OPEN FILE FOR DRAGON USERS

Send us your Dragon programs, beginning with a general description and then explaining how the program is constructed. Take care that the listings are all bug-free, enclosing a cassette and, if possible, a printout. We pay £6 for each bug-free program published, double for the program of the month. If you have any problems with the listings, please send your queries to the appropriate author, *Dragon User*, 12-13 Little Newport Street, London WC2R 3LD.

Patterns

Patterns

From Iolo ap Gwynn from Aberystwyth

THIS SHORT PROGRAM illustrates the range of possibilities that the combined use of various PMODEs and PCOPY statements give us in terms of enlarging the image, etc. Some interesting things happen when you PCOPY a graphics page generated in colour in PMODE3, representing a quarter of the screen in that mode, to a single black and white page in PMODE0 filling the whole screen.

By randomising the whole process one gets an almost endless variation of patterns.

Then randomise the accompanying sound as well and the effect becomes quite mesmerising.

The further addition of randomised CIRCLE commands leads to an even more interesting effect, but we will leave you to experiment with that.

```
10 ' PATTERNS  c I.ap Gwynn, 10/83
20 ' ** A program to demonstrate some variations on PMODE and PCOPY
30 PCLS RND(5)-1
40 PMODE RND(5)-1,1:SCREEN 1,1
50 FOR X=2 TO 255 STEP RND(10)
60 COLOR RND(4),RND(4)
70 LINE(0,X)-(X,0),PSET
80 LINE(255,X)-(255-X,0),PSET
90 NEXT
100 FOR X=2 TO 255 STEP RND(10)
110 LINE(0,X)-(X,0),PRESET
120 LINE(255,X)-(255-X,0),PRESET
130 NEXT
140 SOUND RND(255),2
150 FOR I=1 TO 4
160 PCOPY I TO RND(4)
170 NEXT
180 GOTO 40
```

Spelling

From Bob Palmer in Harrow

LAST CHRISTMAS my neighbour came and asked my advice on whether he should buy a dedicated Speak & Spell machine for his son, or a home microcomputer with a spelling tutor type program. At that time I was not aware if there were any spelling programs available for micros but I did know that the pronunciation of some of the Speak & Spell machines, and their range of vocabulary, left a lot to be desired.

Both of these factors I considered to be very important. After all, correct pronunciation is a prime requisite of good spelling, and the ability of the machine to progress with the student is essential for it to be worthwhile. At that time I decided to write a quick program to demonstrate the Dragon's capabilities.

I then did no more on this project until several weeks ago, when in my local library, I overheard a mother asking if there were any books to help her 11-year-old son improve his spelling. I thought . . . is a book an appropriate tool in this age of television, home videos and electronic machines? Surely a computer program that could teach spelling would be more appealing to a young person and therefore more effective.

I decided then to dust off my original program and write what I hope is an effective but enjoyable update. The program Spell has instructions "built-in". I suggest that you run the program once, straight into Spelling Tutor, then re-run and go into the "speech input mode". The password is SPELL1.

Program notes

Lines	
30-90	Page one of introduction.
100-110	Page two of introduction.
120-280	Password entry routine.
330-340	Spelling data.
350-380	Data read statements.
400-450	Page one of speech data input instructions.
460-510	Page two of speech data input instructions.
520-700	Speech data input routine (line 640 FOR D = 1 TO 1700 is for the time allowed to input a word: approx. 2.5 secs.).
720-740	Page one of spelling instructions.
750-800	Initialising Array SD with score data.
820-980	Page two of spelling instructions (line 920 FOR D = 1 TO 1700 is the playback time for a word (the complement of line 640)).
1440-1530	Spelling check routine (this routine sets FL to 1 if the words do not match).
1020-1060	Correct answer routine.
1070-1090	Incorrect answer routine.
1100-1180	Page three of spelling instructions (vowel identification routine).
1190-1200	Continuation of page three. ▶

1230-1350 Page four of spelling instructions.
1540-1636 Score selection and display.

1637-1680 Final page of spelling tutor. Note that it would be possible to include in the speech data input a phrase such as . . . SPELL PRACTICE, AS IN YOU MUST PRACTICE EVERY DAY by increasing the value of D in lines 640 and 920.

```
0 DIM D$(10),SC$(6)
20 CLS
30 '* PAGE 1 OF INTRODUCTION` *
40 PRINT@32+6,"SPELLING TUTOR"
50 PRINT@64+6,"BY BOB PALMER (C)"
60 PRINT@193,"IN A FEW MOMENTS YOU WILL HEAR  TONES. PLEASE ADJUST THE VOLUME OF
 THE TELEVISION FOR COMFORT-  ABLE LISTENING.                 PLEASE PRESS THE S
PACEBAR TO    CONTINUE.
70 FOR D=1 TO 1000:NEXT D
80 SOUND 89,4:SOUND 100,4:SOUND 70,4
90 IF INKEY$ <> CHR$(32) THEN 80
100 CLS:FOR D=1 TO 400:NEXT D
110 PRINT@161,"IF YOU NEED TO ENTER SPEECH     DATA... ENTER YOUR 'PASSWORD'   E
LSE PRESS THE SPACEBAR TO      CONTINUE WITH SPELLING TUTOR
120 SW$="SPELL1"
130 TW$="":CT=0:X$=INKEY$
140 A$=INKEY$:IF A$ = "" THEN 140
150 IF A$=CHR$(32) THEN 300
160 TW$=TW$+A$
170 CT=CT+1
180 IF LEN(SW$) <> CT THEN 140
190 IF TW$ = SW$ THEN 310
200 EC=EC+1
210 IF EC = 3 THEN 270
220 PRINT@327,"INCORRECT PASSWORD"
230 PRINT@392,"PLEASE TRY AGAIN"
240 FOR D = 1 TO 1000:NEXT D
250 PRINT@392,""
260 PRINT@327,"":GOTO 130
270 PRINT@327,"INCORRECT PASSWORD"
280 PRINT@388,"PASSWORD ENTRY ABANDONED"
290 FOR D = 1 TO 1000:NEXT D
300 FL=2
310 ' * CHARS STRING ROUTINE  *
320 CLS
330 DATA NEITHER,FORFEIT,LEISURE,PROTEIN,SEIZE
340 DATA SOVEREIGN,SURFEIT,WEIR,FOREIGN,WEIRD
350 DL=10
360 FOR I=1 TO DL
370 READ D$(I)
380 NEXT I
390 IF FL = 2 GOTO 720
400 PRINT@33,"THE PROGRAM IS SET-UP TO ACCEPT TEN WORDS. THESE ARE STORED IN  DA
TA STATEMENTS.
410 PRINT@161,"INSTRUCTIONS FOR CHANGING THE   TEXT OF WORDS TO BE SPELLED...
420 PRINT@225,"1/ FIRST EDIT LINES 330 & 340      AND ENTER THE NEW TEXT.
430 PRINT@289,"2/ CSAVE THE NEW PROGRAM, THEN     CLOAD AND RUN.
440 PRINT@384,"IF YOU HAVE COMPLETED 1 & 2      ABOVE PRESS SPACEBAR TO CONTINUEE
LSE PRESS break KEY."
450 IF INKEY$<> CHR$(32) THEN 450
460 CLS
470 PRINT@37,"RECORDING SPEECH DATA"
480 PRINT@97,"1/ REMOVE THE 'MIC' OR 'AUX'       PLUG FROM THE CASSETTE
 RECORDER
490 PRINT@193,"2/ SET THE RECORDER CONTROLS       TO 'RECORD'"
500 PRINT@289,"3/ IF YOUR RECORDER DOES NOT       HAVE A BUILT-IN MICROPHONE:
  CONNECT MICROPHONE
510 PRINT@417,"PRESS THE SPACEBAR WHEN YOU     ARE READY TO RECORD"
520 IF INKEY$ <> CHR$(32) THEN 520
530 CLS
540 CS=1
550 PRINT@33,"THE WORD TO                      PRONOUNCE IS... ";D$(CS)
560 PRINT@129,"THIS SHOULD BE PREFIXED WITH    THE WORD 'SPELL'
570 FOR D = 1 TO 2000:NEXT D
580 CLS
590 PRINT@129,"PLEASE SPEAK AFTER THE TONES"
600 FOR D = 1 TO 800:NEXT D
```

Continued on page 50

```
610 SOUND 125,4
620 SOUND 89,6
630 MOTOR ON
640 FOR D = 1 TO 1700:NEXT D
650 MOTOR OFF
660 IF CS = DL THEN 680
670 CS = CS + 1:CLS: GOTO 550
680 CLS
690 PRINT@129,"NOW REWIND THE TAPE TO THE       BEGINNING OF THE PROGRAM AND     C
LOAD. THIS WILL POSITION THE   SPEECH PART OF THE TAPE          CORRECTLY
700 PRINT@321,"PLEASE REMEMBER TO REPLACE YOUR MIC/AUX PLUG.
710 GOTO 1680
720 PRINT@67,"WELCOME TO SPELLING TUTOR"
730 PRINT@128,"IN A FEW MOMENTS YOU WILL HEAR ASERIES OF WORDS.
740 PRINT@224,"CAREFULLY NOTE THE PRONUNCIATIONOF EACH WORD, THEN FOLLOW THE    D
ISPLAYED INSTRUCTIONS.
750 SD$(1)="          YOU NEED PRACTICE"
760 SD$(2)=" NOT GOOD, BUT DO NOT WORRY YOU  WILL SOON IMPROVE WITH PRACTICE"
770 SD$(3)=" GOOD, KEEP PRACTICING AND YOU   WILL SOON ACHIEVE AN EXCELLENT  SCO
RE"
780 SD$(4)=" VERY GOOD! NOT FAR FROM AN      EXCELLENT SCORE"
790 SD$(5)=" WELL DONE! AN EXCELLENT SCORE"
800 SD$(6)=" WELL DONE! A PERFECT SCORE, YOU ARE NOW READY TO GO ON TO THE   NEX
T PROGRAM"
810 PRINT@418,"PLEASE PRESS THE SPACEBAR TO    CONTINUE
820 EP$=" ** IF YOU MAKE AN ERROR, TO **  ** RESTART LINE, PRESS KEY:"
830 IF INKEY$<>CHR$(32) THEN 830
840 CLS                   850 CP=CP+1
860 IF CP<=DL THEN GOTO 880
870 GOTO 1540
880 PRINT@7,"LISTEN CAREFULLY"
890 FOR D = 1 TO 200:NEXT D
900 AUDIO ON
910 MOTOR ON
920 FOR D = 1 TO 1700:NEXT D
930 MOTOR OFF
940 AUDIO OFF
950 PRINT@69,"NOW TYPE IN THE WORD"
960 PRINT@192,"AS SOON AS YOU HAVE TYPED IN THECORRECT NUMBER OF CHARACTERS     Y
OUR WORD WILL BE CHECKED. IF    TOO FEW CHARACTERS ARE USED THE WORD WILL REMAIN
ON THE SCREEN.
970 PRINT@352,"THIS ALONE WILL INDICATE THAT   THE SPELLING IS INCORRECT.
980 PRINT@416,EP$;CHR$(127);" *"
990 L=LEN(D$(CP))
1000 GOSUB 1440
1010 IF FL=1 THEN 1070
1020 CLS:SC=SC+1:IF CP=DL THEN 1540
1030 SOUND 136,4:SOUND 100,6
1040 PRINT@196,"CORRECT, PLEASE CONTINUE"
1050 FOR K=1 TO 1000:NEXT K
1060 CLS:CT=0:G$="":GOTO 840
1070 CLS
1080 PRINT@68,"YOU HAVE MADE AN ERROR.
1090 FOR D = 1 TO 900: NEXT D:CLS
1100 PRINT@35,"TO HELP YOU, HERE ARE THE       POSITIONS OF THE VOWELS..."
1110 PRINT@416,EP$;CHR$(127);" *"
1120 C$(1)="A":C$(2)="E":C$(3)="I":C$(4)="O":C$(5)="U"
1130 FOR I=1 TO L
1140 FOR C=1 TO 5
1150 IF MID$(D$(CP),I,1)=C$(C) THEN PRINT@104+I,C$(C);:SOUND 150,1:FOR D=1 TO 20
0:NEXT D:GOTO 1170
1160 NEXT C:PRINT@104+I,"-";:SOUND 200,3:FOR D=1 TO 200:NEXT D
1170 NEXT I
1180 FOR D=1 TO 200:NEXT D
1190 PRINT@197,"NOW PLEASE TRY AGAIN"
1200 GOSUB 1440
1210 IF FL=1 THEN 1230
1220 GOTO 1020
1230 CLS:PRINT@32,"YOU HAVE MADE ANOTHER ERROR BUT DO NOT WORRY, HERE IS THE
   CORRECT SPELLING...";
```

Continued on page 52

```
1240 FOR I=1 TO 7
1250 SOUND 150,1
1260 PRINT@192+I,">";
1270 FOR D = 1 TO 200:NEXT D
1280 NEXT I
1290 FOR NC = 1 TO L
1300 FOR D = 1 TO 400:NEXT D
1310 SOUND 200, 3
1320 PRINT@201,LEFT$(D$(CP),NC)
1330 NEXT NC
1340 PRINT@321,"PLEASE COPY THE WORD TO          CONTINUE"
1350 PRINT@416,EP$;CHR$(127);" *"
1360 GOSUB 1440
1370 IF FL=1 THEN 1360
1380 GOTO 840
1390 PRINT@194,"YOU MADE AN ERROR, PLEASE          TRY AGAIN"
1400 FOR K=1 TO 2000: NEXT K
1410 CLS
1420 GOTO 950
1430 GOTO 370
1440 PRINT@136,"":CT=0:G$="":FL=0:A$="":X$=INKEY$
1450 A$=INKEY$:IF A$="" THEN 1450
1460 IF A$<>CHR$(8) THEN 1480
1470 GOTO 1440
1480 CT=CT+1
1490 PRINT@136+CT,A$;
1500 G$=G$+A$            1510 IF CT<>L THEN 1450
1520 IF G$<>D$(CP) THEN FL=1:RETURN
1530 RETURN
1540 CLS:SOUND 125,4:SOUND 89,6
1550 ON SC+1 GOTO 1560,1570,1570,1570,1570,1580,1580,1590,1590,1600,1610
1560 SC$=SD$(1):GOTO 1620
1570 SC$=SD$(2):GOTO 1620
1580 SC$=SD$(3):GOTO 1620
1590 SC$=SD$(4):GOTO 1620
1600 SC$=SD$(5):GOTO 1620
1610 SC$=SD$(6):GOTO 1620
1620 PRINT@224,SC$
1630 PRINT@129,"YOU HAVE CORRECTLY SPELLED ";SC ;" OUT OF";DL;"WORDS"
1636 FOR D=1 TO 5000:NEXT D
1637 SOUND 125,4:SOUND 89,6
1640 PRINT@39,"YOU HAVE COMPLETED                 SPELLING TUTOR"
1650 PRINT@129,"PLEASE PRESS THE STOP CONTROL   OF THE CASSETTE RECORDER"
1660 PRINT@225,"IF YOUR SCORE IS LESS THAN:";DL
1670 PRINT@257,"REWIND % RECLOAD AND TRY AGAIN
DO NOT MAKE MORE THAN THREE     ATTEMPTS AT ONE SESSION AND NOT MORE THAN ONE SE
SSION A DAY                                     THANK YOU!
1680 GOTO 1680
```

Roadride

From Andrew Thompson in Heathfield

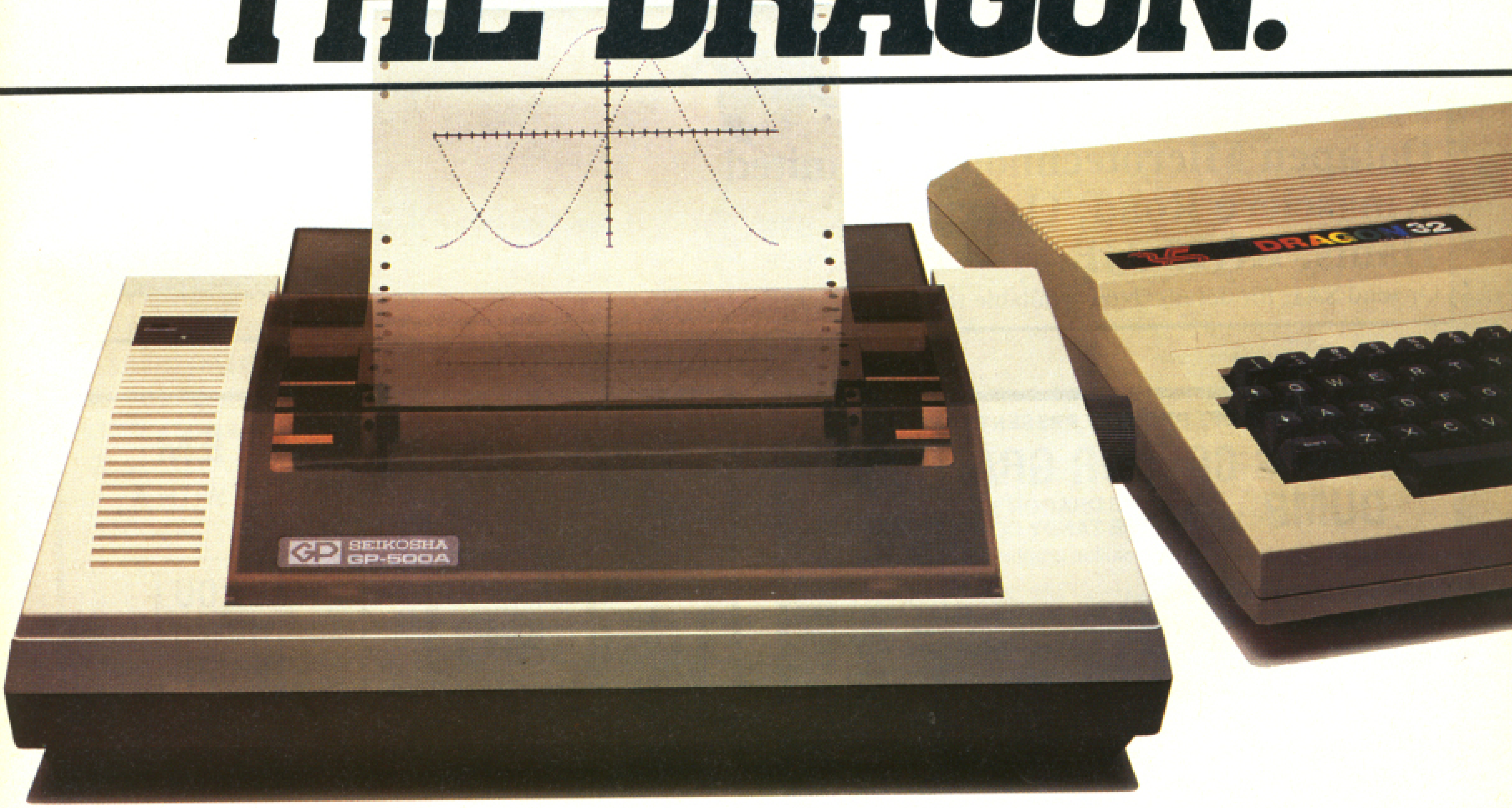
ROADRIDE IS a game where you have to drive a car through a narrow stretch of road. The further you go, the smaller the road gets.

The left and right arrow keys are used for movement. Sound is optional. Instructions are given in the program. The machine code is a sound routine; it is used to get sound constantly through the program. If the speed-up poke (POKE 65495, 0) doesn't work on your computer, delete line 220.

```
10 FORP=20000TO20006
20 READA$
30 POKEP,VAL("&H"+A$)
40 NEXT
50 POKE411,&H4E
60 POKE412,&H20
70 POKE410,&HBD
80 DATABD,BA,B3,BD,BA,C5,39
90 CLS0
100 PRINT@192,"";
110 LINEINPUT"DO YOU WANT INSTRUCTIONS?"
;A$
120 IFLEFT$(A$,1)="Y"THEN900
130 IFLEFT$(A$,1)="N"THEN160
140 CLSRND(9)-1
150 SOUNDRND(255),2:GOTO90
160 CLEAR400
170 CLS7
180 PRINT@193,"DO YOU WANT SOUND?";
190 A$=INKEY$
```

Continued on page 57

AT £249.00, THE TAIL'S NOT WAGGING THE DRAGON.



You could pay a lot more for a printer to interface with your Dragon.

But it seems crazy to team a micro with an add-on carrying a price tag running into three or four hundred pounds.

Especially when the revolutionary Seikosha GP500A does so much for so little.

For example, it's got full graphics capability, with a single command enabling a column of graphic data to be repeated as many times as you need.

Printing speed is 50 characters a second in an 80 column dot matrix format on standard width paper adjustable up to 10 inches.

And under its compact casing, the Seikosha packs a wealth of sophisticated features like automatic printing (no data lost due to overflow), intermixing of graphic, character and double-width character modes on a single line and printing of a copy as well as the original.

It all adds up to a quality, reliable add-on that breathes new fire into your Dragon's performance: accounts, cataloguing, lists, charts, diagrams and program debugging are now all available in print.

See the Seikosha GP500A in action - phone for details and the address of your nearest dealer.

SEIKOSHA **DRG**

DRG Business Systems, Peripherals Division, 13-14 Lynx Crescent, Winterstoke Rd, Weston super Mare, Avon BS24 9DN.
Telephone: 0934 419914. Telex: 444761.

£25 inclusive

A QUALITY LIGHTPEN

For the DRAGON 32*

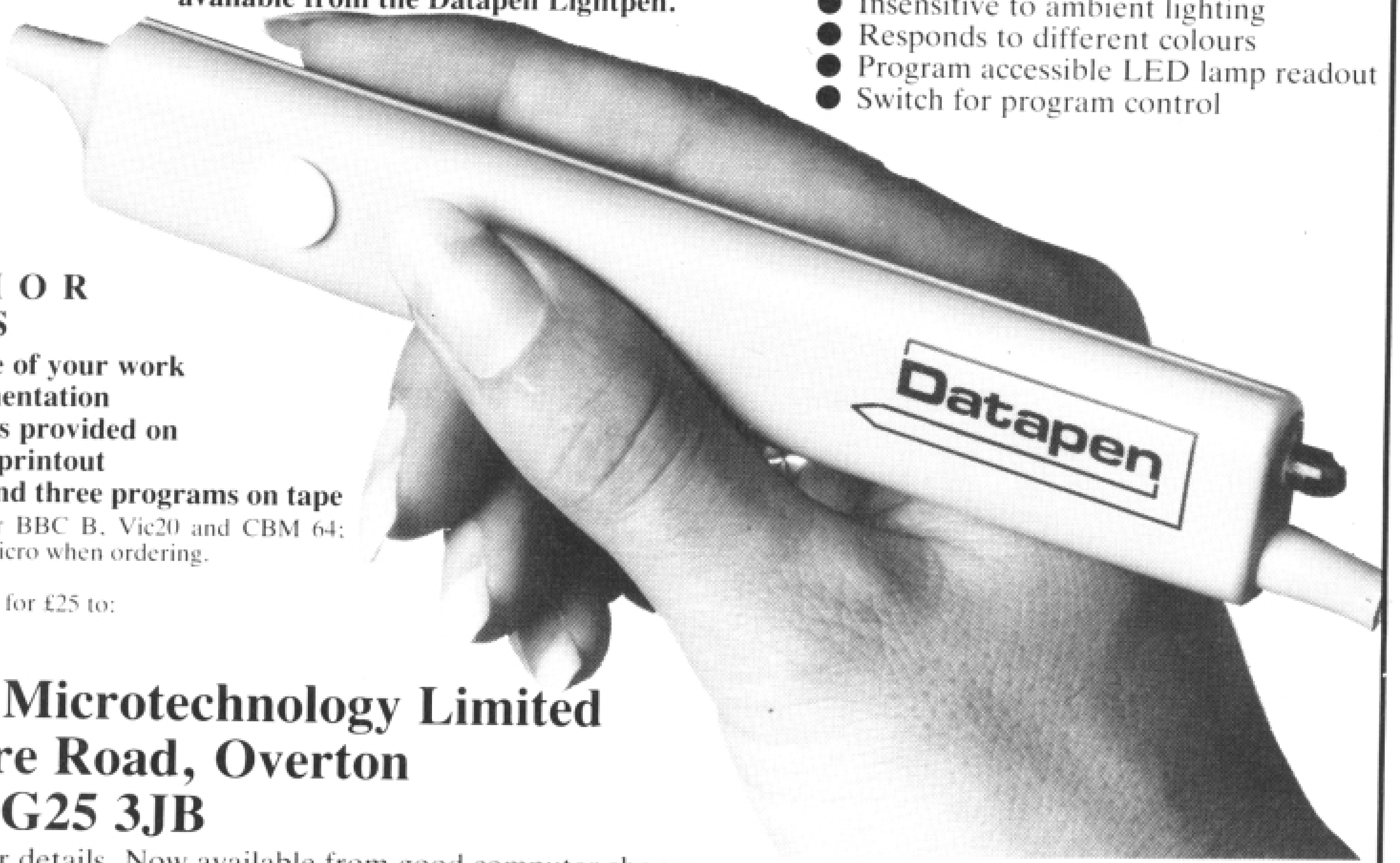
Optimum program performance is achieved by use of the superb features only available from the Datapen Lightpen.

Drawing:
PMODE1 and PMODE4
Freehand,
hidden grid,
line, circle,
paint, erase.

Also:
X-Y position,
target menu,
text menu and
library shapes.

SUPERIOR PERFORMANCE

- Insensitive to ambient lighting
- Responds to different colours
- Program accessible LED lamp readout
- Switch for program control



SUPERIOR PROGRAMS

- **Tape storage of your work**
- **Good documentation**
- **User routines provided on tape and on printout**
- **Handbook and three programs on tape**

*Also available for BBC B, Vic20 and CBM 64; please state your micro when ordering.

Send cheque or PO for £25 to:

Dept DU3

Datapen Microtechnology Limited
Kingsclere Road, Overton
Hants. RG25 3JB

Or send SAE for details. Now available from good computer shops.

DELTASOFT PROUDLY PRESENTS THE

HI-RES COLOUR GRAPHICS DUMP

FOR THE DRAGON 32 AND THE TANDY CO-CO

You can now copy all High Resolution graphics screens available from Basic on to paper with a:
Tandy CGP 115 (Printer plotter)
MCP-40 4 colour printer plotter
Oric printer
Sharp Printer plotter
and the Colour Graphics Dump program.

This program dumps all the graphic screen available from basic, both monochrome and colour. Extensive features include:

★ Choice of any two or four colours from a palate of 15
★ HALF HEIGHT and HALF WIDTH modes if the graphics mode allows
★ Special SLOW MODE for greater accuracy and greater depth of colour
★ EXTRA HEIGHT mode for dumping more than a full screen and others

Available from DELTASOFT at the special low price of only £4.95 each

Please make cheques and POs out to Deltasoft and send away today to: DELTASOFT, 40 Windsor Road, Doncaster, DN2 5BT.
Tel: 0302-61016
Trade Enquiries Welcome

Dragon 32	☐ £4.95
Tandy Co-Co	☐ £4.95
Tandy CGP 115	☐
MCP-40	☐

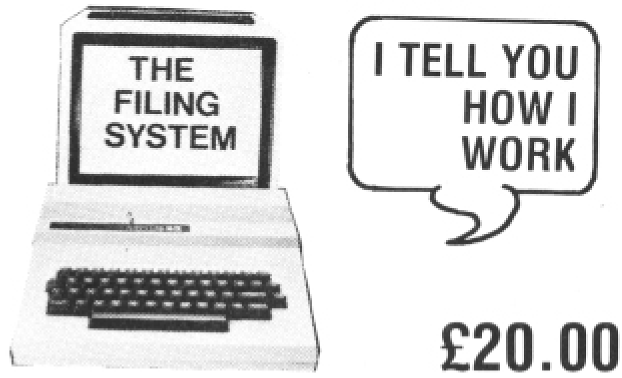
Name...

Address...

....Postcode..........

THE FILING SYSTEM

A PROFESSIONAL PROGRAMME WITH A BUILT-IN TEACHER



£20.00

A record-keeping system of business standard which uses the Dragon's audio track to teach you how to use it. President in A4 ring binder and accompanied by a comprehensive user manual and full program listing.

THE FILING SYSTEM GIVES YOU:

★ Multiple search on any of 22 fields.
★ Four different types of search.
★ Up to 300 records in memory.
★ Fast sort on any of 22 fields.
★ Mathematical functions within and through records.
★ Print in label or column format with column total.
★ Plus other features normally found in disc-based packages costing £200+.

A very progressional product . . . Well worth the money *(PCW 3 Nov 1983)*

We even give you a *'customer hot-line'* in case you have difficulties. All this for £20! But don't send us your money! Write to us and we'll send you a full information sheet.

Coming shortly – Dragon disk version and Electron version

Progressive Software
Marsh Street, Walsall, West Midlands
Telephone: Walsall 640593
★ *DEALER ENQUIRIES WELCOME* ★

```
200 IFA$=""THEN170
210 IFA$="N"THENPOKE20000,57ELSEIFA$="Y"
THENPOKE20000,&HBD ELSE170
220 POKE65495,0
230 CLS0
240 FORP=0TO10
250 A$(P)=STRING$(17+P,239)+STRING$(16-P
,128)
260 NEXT
270 S=0
280 L=5
290 D=1
300 I=0
310 L2=30
320 Y=20
330 POKE140,1
340 IFPEEK(343)=223THENX=X-1:IFX<0THENX=
0
350 IFPEEK(344)=223THENX=X+1:IFX>31THENX
=31
360 Y=Y+D
370 S=S+5
380 IFY<17-I THENY=Y+1:D=-D
390 IFY>L2 THENY=L2:D=-D
400 PRINT@480+Y,A$(I);
410 IFPEEK(1024+X)=239THEN480
420 POKE1024+X,175
430 IFRND(5)=1THEND=-D
440 IFT>100THENI=I+1:POKE140,I*5+1:T=0:I
FI>10THEN610
450 T=T+1
460 POKE1024+479+RND(32),239
470 GOTO340
480 CLS
490 PRINT"YOU CRASHED"
500 PRINT"YOUR SCORE IS"S
510 L=L-1
520 IFL<=0THEN780
530 PRINT"YOUR NUMBER OF LIVES ARE"L
540 POKE410,57
550 FORP=1TO2000
560 NEXT
570 POKE410,&H7E
580 CLS0
590 GOTO340
600 END
610 FORP=1TO16
620 PRINTSTRING$(32,128);
630 IFPEEK(1024+X)=239THENI=10:T=0:GOTO4
80
640 POKE1024+X,175
650 IFPEEK(343)=223THENX=X-1:IFX<0THENX=
0
660 IFPEEK(344)=223THENX=X+1:IFX>31THENX
=31
670 IFPEEK(20000)<>57THENPOKE140,P*10ELS
EFORDL=1TO10:NEXT
680 NEXT
690 PRINT
700 PRINT"YOU HAVE FINISHED THAT ROAD"
710 PRINT"YOUR SCORE IS"S
720 IFL>1THENPRINT"AND YOU HAD"L"LIVES L
EFT"ELSEPRINT"AND YOU HAD A LIFE LEFT"
730 POKE410,57
740 FORP=1TO4000
750 NEXT
760 POKE410,&HBD
770 GOTO850
780 CLS0
790 PRINT"OUT OF LIVES"
800 PRINT@96,"YOUR SCORE WAS"S;
810 POKE410,57
820 FORP=1TO3000
830 NEXT
840 POKE410,&HBD
850 CLSRND(9)-1
860 LINEINPUT"DO YOU WANT ANOTHER GAME?"
;A$
870 IFLEFT$(A$,1)="Y"THEN160
880 IFLEFT$(A$,1)="N"THENPOKE65494,0:POK
E410,57:END
890 GOTO850
900 CLS
910 PRINT@489,"ROADRIDE"
920 PRINT@492,"BY"
930 PRINT@490,"ANDREW"
940 PRINT@489,"THOMPSON"
950 FORP=1TO6
960 PRINT
970 SOUND1,1
980 NEXT
990 POKE410,57
1000 FORP=1TO500
1010 NEXT
1020 POKE410,&HBD
1030 FORP=1TO9
1040 PRINT
1050 SOUND1,1
1060 NEXT
1070 CLS
1080 PRINT"ROADRIDE IS A GAME WHERE YOU"
1090 PRINT"HAVE TO DRIVE A CAR TO THE EN
D"
1100 PRINT"OF THE ROAD. YOU USE THE LEFT
"
1110 PRINT"AND RIGHT ARROW KEYS TO CONTR
OL"
1120 PRINT"YOUR CAR."
1130 PRINT"AS YOU GO ON THE ROAD GETS"
1140 PRINT"SMALLER."
1150 PRINT@480,"press the spacebar to st
art";:
1160 POKE1509,32
1170 POKE1513,32
1180 POKE1522,32
1190 POKE1525,32
1200 IFPEEK(345)=223THEN160
1210 GOTO1200
```

SLIK Software present a **Great New Graphic Adventure Game** for the DRAGON 32

★ SUNKEN CITY ★

A complete, role-playing adventure, with full high-res graphics and colour.

Travel across five continents in search of the fabulous treasure of the Sunken City.

Visit the pyramids and the lost tombs of the Incas, encountering dozens of deadly enemies . . .

Avoid pirates and other hazards on deep sea voyages to mystic lands. Beware of cannibals and head-hunters in Africa's savage jungles . . .

Free the dying wizard and discover his vital secret in your final search for the Sunken City.

This absorbing, addictive game uses the full resources of the Dragon 32 and is a challenge to your skill and ingenuity which will keep you glued to your screen for many, many hours!

For fast delivery send name, full address and cheque or PO for £7.95 NOW!

To: Slik Software, 19 Sancroft Street, London SE11 5UG.

DON'T JUST PLAY GAMES!

EDUCATIONAL SOFTWARE

Physics (O level/CSE Revision)
Biology (O level/CSE Revision)
Computer Studies (O level/CSE)
Spelling (Improver 9/99 years)
Mathematics (Practice 8/11 years)
Reasoning (11+Revision)
Science (Revision 12/14 years)
English (Revision 12/14 years)
Maths (CSE Revision)
Sports (Quiz 9/99 years)
Tables (Practice 7/11 years)
Knowledge (Quiz 9/99 years)
English (Practice 8/11 years)
Arithmetic (Practice 7/10 years)
Maths (Revision 12/14 years)

Unbeatable value at £4.95 each. Post free.

'O' Level-CSE Computer Studies

A set of four cassettes, jam-packed with up to date knowledge covering the 'O' level/CSE syllabuses. Full tutorial with revision questions.

Subject areas include:
Data coding, Data Storage, Computer Arithmetic, Computer Logic, Processing Information, Society and Computers, Computer Structure, Backing Storage
and much, much more.

Also suitable as a general introduction to the computing world (Mums and Dads please note).

FANTASTIC VALUE AT £14.50 per set

PRO-FILE £9.95
The cassette based filing system

Hundreds of uses in the home. Easy-to-understand 56-page manual. Design your own file layout.
"Your computer is actually useful" (PCW July 83)
"Pro-file does everything it claims, and does it well" (Which Micro November 1983).
"One of the best manuals of its type I have seen, ideal for the novice" (PCW December 83).

Cheques and PO to:

MICRO-DE-BUG CONSULTANCY
Dept. U, 60 Sir John's Road, Selly Park
Birmingham B29 7ER. Tel: 021-472 7610

JOYSTICKS FOR THE DRAGON 32



ONLY
£18.95 a pair

Top quality, self-centring, easy to handle joysticks for the enthusiastic games player

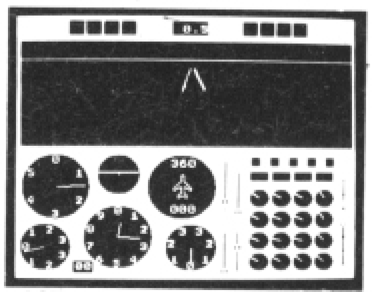
£1.00 OFF WHEN YOU RETURN THIS ADVERTISEMENT WITH YOUR ORDER
Please add 75p p&p

To order, send Cheque/PO to: **CASCOM**
67 ELSTOW ROAD, BEDFORD MK42 9NT

DRAGON/32 BBC MODEL/B ATARI 400/800 TRS80 C/C 32K ELECTRON

747 FLIGHT SIMULATOR

Superbly realistic instrumentation and pilot's view in lifelike simulation which includes emergencies such as engine fires and systems failures. This program uses high resolution graphics to the full to produce the most realistic flight-deck display yet seen on a home computer. There are 21 real dials and 25 other indicators (see diagram). Your controls operate throttle, ailerons, elevators, flaps, slats, spoilers, landing gear, reverse thrust, brakes, etc. You see the runway in true perspective. Uses joysticks and includes options to start with take-off or random landing approach. "A real simulation, not just another game" *(Your Computer, April 19 '83).*



ACTUAL SCREEN PHOTOGRAPH

Cassette £9.95 (p&p and VAT included):

DACC Ltd (Dept. DU)
23 Waverley Road, Hindley, Greater Manchester WN2 3BN.
(Despatch within 48 hours)

In US $27.95 (p&p included)
Order from sole distributor:
Frank Ashton (Dept. DU)
PO Box 7037
Chula Vista CA 92012 7037
(California residents add 6% sales tax)

M & J SOFTWARE

"DRAGON ADVANCED PROGRAMMER'S PACKAGE"

We provide the most comprehensive FORTH implementation on the market — just compare our specifications with those of other FORTH packages. You get:

1. The language itself which can access Basic commands from within FORTH programs therefore retaining the Dragon's graphics capabilities.
2. A powerful text editor which can be used not only for preparing programs but also as a limited word processor.
3. A 6809 macroassembler.
4. The fig-FORTH Installation Manual which contains the FORTH source code, glossary etc.
5. A manual containing lots of example programs including the source code for the 6809 macroassembler.

But this is not all!
To complete the package we provide a copy of the "Dragon Companion". This excellent publication contains a full 6809 disassembler, an extensive Dragon memory map, details of how to access extra graphics models, how to merge programs and lots more. **ONLY £15.00**

All prices inclusive of p&p. Cheques and POs please to:

M & J SOFTWARE
34 Grays Close, Scholar Green
Stoke-on-Trent ST7 3LU. Tel: (0782) 517876



MONSTER SOFTWARE CLUB

SOFTWARE LIBRARY FOR THE DRAGON 32

- ★ **Software for hire from 11 manufacturers**
- ★ **Over 90 titles to choose from, and growing**
- ★ **TWO YEARS membership for only £8.00**
- ★ **Same-day service**

Software at 10% discount. Send SAE for details and list of titles available to:

MICROBYTE COMPUTER SHOP
19a Lower Warrengate
Wakefield WF1 1SA

Datasave

From A Bowden in Market Drayton

THE VERSION OF Basic supplied with the Dragon 32 has one very useful command for the purposes of information retrieval — the INSTR command. For anyone who is unfamiliar with its function, it allows you to search through any string of characters to find a "target" string (eg a word). This means that you can type in any characters you like, and then ask the computer to search for any character or group of characters you may wish to find.

As I wanted a simple (and cheap) bit of software to keep a record of my photographic slides, I wrote the short program Datasave which utilises this command to allow me to find any slide on any subject simply by entering an appropriate word for the computer to find in my data records.

Input of data is limited to two fields, but I find this adequate for most purposes. The program will allow you to save a data file on tape and recall it for alteration and scrutiny. It could, of course, be used for many purposes: names and telephone numbers, any simple cataloguing, a dictionary, etc. You are also given the facility to print out individual records if you wish.

The program has, of course, only limited facilities, but is a reasonable basis for expansion.

Things to note:

1 If you want to create a data file when you already have one in memory it is necessary to end the program run and start again.

2 When you save data to tape the tape recorder is switched on so that you can move to a clear section of your tape. Do this *before* you enter a filename and press ENTER.

3 If you list the whole data file, the up and down arrow keys have auto-repeat.

```
1 REM*****DATASAVE*****
2 REM**A.D.BODEN 1983**
10 PCLEAR1
20 CLEAR 20000
30 CLS
40 C=1
50 DIM A$(200)
60 DIM B$(200)
70 GOTO 1170
80 CLS:PRINT"data store and search"
90 PRINT:PRINT:PRINT"TYPE IN RECORD THEN
 PRESS enter"
100 PRINT:PRINT"(UP TO 200 RECORDS)"
110 PRINT:PRINT:PRINT"PRESS ENTER TWICE
TO END"
120 PRINT:PRINT:PRINT:PRINT:PRINT"press
a key to begin"
130 IF INKEY$="" THEN 130
140 CLS
150 PRINTC;"."
160 PRINTF1$;"--->"
170 LINE INPUT A$(C)
180 PRINTF2$;"--->"
190 LINE INPUT B$(C)
200 IF A$(C)="" AND B$(C)="" THEN RETURN
210 C=C+1
220 GOTO 150
230 CLS
240 PRINT:PRINT:PRINT"ENTER STRING FOR S
EARCH"
250 LINE INPUT S$
260 CLS
270 FOR A=1 TO C-1
280 I=INSTR(1,A$(A),S$)
290 J=INSTR(1,B$(A),S$)
300 IF I=0 AND J=0 THEN 400
310 PRINTA;"."        320 PRINTF1$
330 PRINTA$(A)        340 PRINTF2$
350 PRINTB$(A)
360 PRINT:PRINT:PRINT:PRINT"press a key
--- RIGHT ARROW TO  END","P TO PRINT"
370 Q$=INKEY$:IF Q$="" THEN 370
380 CLS:IF Q$=CHR$(9)THEN RETURN
390 IF Q$="P" THEN GOSUB 1100:GOTO 310
400 NEXT                 410 RETURN
420 CLS
430 PRINT"YOU CAN ENTER TWO FIELDS OF
  INFORMATION"
440 PRINT:INPUT "TITLE OF FIELD ONE ";F1
$
450 PRINT:INPUT"TITLE OF FIELD TWO ";F2$
460 GOSUB 80
470 RETURN
480 CLS:INPUT"ENTER FILENAME";F3$
490 OPEN "I",#-1,F3$
500 C=1
510 INPUT#-1,F1$,F2$
520 IF EOF(-1) THEN 560
530 INPUT #-1,A$(C),B$(C)
540 C=C+1                550 GOTO 520
560 CLOSE#-1:RETURN
570 CLS
580 MOTOR ON
590 INPUT "FILENAME";F3$
600 OPEN"O",#-1,F3$
610 PRINT#-1,F1$,F2$
620 FOR Z=1 TO C
630 PRINT#-1,A$(Z),B$(Z)
640 NEXT Z
650 CLOSE#-1:RETURN
660 CLS:INPUT"TYPE NUMBER OF RECORD YOU
WISH  TO CHANGE--";X
670 PRINT:PRINT"PRESENT ENTRY FOR RECORD
 ";X
680 PRINTF1$             690 PRINTA$(X)
700 PRINTF2$
710 PRINTB$(X)
720 PRINT:PRINT:PRINT"ENTER NEW DATA"
730 PRINT:PRINTF1$          "
740 LINE INPUT A$(X)
750 PRINTF2$;"--->"
760 LINE INPUT B$(X)        770 RETURN
780 CLS:END
790 CLS
800 PRINT"DO YOU WANT TO -"
810 PRINT:PRINT"1. SEARCH FILE"
820 PRINT"2. LIST ALL RECORDS"
830 PRINT:PRINT:PRINT"enter number"
840 Q$=INKEY$:IF Q$="" THEN 840
```

Continued on page 61

```
850 Q=VAL(Q$)
860 IF Q<1 OR Q>2 THEN 790
870 ON Q GOSUB 230,890
880 RETURN
890 CLS:PRINT:PRINT:PRINT
900 A=1
910 IF A<1 THEN A=1
920 IF A>(C-1) THEN A=C-1
930 PRINT A;"."
940 PRINTF1$
950 PRINTA$(A)
960 PRINTF2$
970 PRINTB$(A)
980 PRINT:PRINT:PRINT"TO MOVE THROUGH FI
LE USE UP AND DOWN ARROW KEYS."
990 PRINT"RIGHT ARROW TO END."
1000 PRINT"P TO PRINT"
1010 Q$=INKEY$
1020 IF PEEK(342)=223 THEN1070
1030 IF Q$=CHR$(9) THEN RETURN
1040 IF PEEK(341)=223 THEN A=A-1:CLS:PRI
NT:PRINT:PRINT:GOTO 910
1050 IF Q$="P" THEN GOSUB 1100:CLS:PRINT
:PRINT:PRINT:GOTO 910
1060 GOTO 1010
1070 CLS:PRINT:PRINT:PRINT
1080 A=A+1
1090 GOTO 910
1100 PRINT#-2,A;"."
1110 PRINT#-2,F1$
1120 PRINT#-2,A$(A)
1130 PRINT#-2,F2$
1140 PRINT#-2,B$(A)
1150 PRINT#-2:PRINT#-2
1160 RETURN
1170 CLS:PRINT"simple filing system"
1180 PRINT:PRINT"DO YOU WANT TO -"
1190 PRINT:PRINT"1. CREATE A FILE"
1200 PRINT"2. LOAD DATA FROM TAPE"
1210 PRINT"3. SAVE DATA TO TAPE"
1220 PRINT"4. SEARCH FILE"
1230 PRINT"5. CHANGE FILE"
1240 PRINT"6. ENTER RECORDS"
1250 PRINT"7. END"
1260 PRINT:PRINT"enter number of choice"
1270 Q$=INKEY$:IF Q$="" THEN 1270
1280 Q=VAL(Q$)
1290 ON Q GOSUB 420,480,570,790,660,80,7
80
1300 GOTO 1170
```

Breakthru

From Garry Saunders in Upper Beeding

THIS IS A short game of Breakthru. The bat will be put on the left-hand side of the screen. Your job is to knock as many bricks out as you can. Along the top there is a record of how many times you hit the ball, how many lives you've lost and your score.

You get 15 points for every brick you knock out. To move the bat use the up and down arrow keys. You have five balls to clear the wall. But don't play the ball off your bat and into the back wall!

```
10 REM ***BREAKOUT***
20 REM ***GARRY SAUNDERS***
30 REM ***30/4/83***
40 POKE65495,0:X=257
50 CLS0:X1=9:Y1=8:XI=2:YI=1
60 FORI=1 TO 31:PRINT@32+I,CHR$(134+48);
70 PRINT@448+I,CHR$(134+48);
80 NEXTI
90 FORT=95TO447STEP32:PRINT@T,CHR$(134+48);:NEXTT
100 FORT=92TO444STEP32:PRINT@T,CHR$(143+112);:NEXTT
110 FORT=91TO443STEP32:PRINT@T,CHR$(143+112);:NEXTT
120 FORT=90TO442STEP32:PRINT@T,CHR$(143+112);:NEXTT
130 FORT=89TO441STEP32:PRINT@T,CHR$(143+112);:NEXTT
140 X2=X1+XI:IF X2>61 THEN XI=-XI:SOUND178,1:GOTO140
150 IF X2<2 THEN GOSUB250
160 IF POINT(X2,Y2)=8 THENGOSUB310
170 Y2=Y1+YI:IF Y2>27 OR Y2<4 THEN YI=-YI:SOUND178,1:GOTO170
180 SET(X2,Y2,8):RESET(X1,Y1):X1=X2:Y1=Y2
190 A$=INKEY$
200 IF A$=CHR$(10)THEN X=X+32
210 IFA$=CHR$(94) THENX=X-32
220 PRINT@X,CHR$(133+64);:PRINT@X+32,CHR$(133+64);:PRINT@X+64,CHR$(128);:PRINT@X
-32,CHR$(128);
230 IF POINT(X1,Y1)=5 THEN XI=-XI:B=B+1:PRINT@3,B;
240 GOTO140
250 L=L+1:IFL>4THEN290
260 PRINT@10,L;
270 SOUND100,1:XI=-XI
280 RETURN
290 PRINT@192+10,"GAME OVER";
300 PRINT@256+3,"HIT ANY KEY FOR ANOTHER GO";:IF INKEY$=""THEN 300 ELSERUN
310 RESET(X2,Y2)
320 RESET(X2-1,Y2):RESET(X2-1,Y2-1)
330 K=K+15
340 PRINT@20,K;
350 RETURN
```

Classified

DUST COVERS

★ DRAGON 32 & 64 ★

made-to-measure in quality natural vinyl with cut-outs for terminals and leads. Just send **£2.95** (no stamp required) to:

ALLEN ENTERPRISES
Freepost, Luton LU2 8BR

AND NOW . . .

ATTRACTIVE CUSTOM-MADE DUST COVERS TO FIT YOUR DRAGON HARDWARE

DRAGON 32
Beige proofed fabric with red taped edge, screen printed with Dragon.
DRAGON 64
Blue proofed fabric with grey taped edge, screen printed with Dragon.
DISC DRIVE
Available in either of above super colour combinations.

Only £3.50 inc p/p

AVAILABLE NOW FROM:
COTSWOLD COVERS,
6 MIDDLE ROW,
CHIPPING NORTON, OXON.
Tel: (0608) 41232.

DRAGON 32/64 SOFTWARE

Games Pack One: 1 Poker (features full colour Hi-res Graphics). 2 Hangman (great game for all the family features full colour Hi-res Graphics). **Both on one tape . . . Price £4.99.** Listing service price 2p per line. Minimum charge £1.00. Send cheques/PO's to: **P. Perris, 88 Poplar Crescent, West Yorkshire BD18 2HH.**

JOYSTICKS DRAGON JOYSTICKS

FULLY PROPORTIONAL WITH FIRE BUTTON

Now only **£12.95 per pair incl.**
+ £1 p&p

PERITRON
21 WOODHOUSE ROAD
LONDON N12 9EN

DRAGON LISTINGS from cassette by return post, first copy £1, second 50p. K. Copeland, 23 The Lane, Awsworth, Nottingham. Tel: 0602 324658.

DRAGON HITEXT. Place text on the hi-res screen with this machine utility. Features 32 x 24 display, six display modes, upper and lower case, reverse, field and double height characters, 224 redefinable characters, £4.95 to: R. Thompson, 7 Brindley Way, Southall, Middx UB1 3JN. Tel: (01-571 3610 evenings.

QUALITY LISTINGS £2 per 1,000 lines. Send programs on cassette. 2 Rudding Drive, Batley, WF17 8QD.

SOFTWARE STOCK CLEARANCE, almost half-price. Tapes from leading software houses. Tel: Chesterfield 2028 for information.

FOR THE DRAGON 32

MOVIE PRODUCER SPECIAL OFFER £6.95

New Original Game

Can you survive the movie business?

With 3D packaging and free red/green glasses

CHEQUE/P.O. to: **ED 40, 249 HIGH ST, STRATFORD, LONDON E15 2LS**

FOR BETTER AND FASTER KEYBOARD control with telewriter. Send £2 for M/L list to: T. Bik Uilenstede 12 1183 AH Amstelveen, Netherlands.

TOP QUALITY EPSON LISTINGS, up to 8K £1.25, 25p per K extra. Cheque/PO and SAE to: A. Kershaw, 36 Redditch Albany Park, Bracknell, Berks.

CENTRAL HEATING CALCULATOR TAPE gives radiator and boiler sizes. Metric tape gives areas, perimeters, volumes and capacities of cylinders, cisterns and pipes with imperial to metric conversions. Ideal for business, college and school use, £7 each. Dragon BBC (B) TRS80 III IV. Torwood Educational Tapes, 250 Leicester Road, Markfield, Leicester.

SAVE TYPING. All programs published in Dragon User in 1983 on one cassette. 75 programs for only £5.95 inclusive. Cheques, postal orders to M.K. Software, 26 Barmoor Close, Scarborough YO13 0RZ.

ELKON ELECTRONICS. Top-shot joystick, as new, £7. Tel: 01-948 3420 after 6 pm.

P. PERRIS EDUCATIONAL SOFTWARE

1. MATHS PACK ONE £2.99
2. MEASURES TESTS £1.80
3. AMERICAN CAPITALS* £1.99
4. HANGMAN* £4.99
5. POKER* £4.99

*Features full colour Hi-Res Graphics.

Send cheques/POs to: P. Perris, 88 Poplar Crescent, Shipley, West Yorks BD18 2HH, or send SAE for full lists.

DUPLIT will duplicate machine program, even autorun, £5. Why not autorun your Basic or machine program, £5. Send to: Tim, 179 Sutton Road, St Helens, Merseyside, WA9 3DU.

QUALITY DRAGON LISTINGS 75p per copy. Graphics screen copies, sizes 11 cms x 8 cms, 20p, 21 cms x 16 cms, 30p. Cassettes, cheques/PO (including 30p postage) and requirements to: Y. Butler, 3 Walbank Road, Armthorpe, Doncaster. Tel: (0302) 833464.

DRAGON PRINTOUT SERVICE. Send £1.75+ cassette and Sae to: Abercrombie House, Town Street, Sutton Cum Lound, Retford, Notts.

COMPUTER PROGRAMS copied (cassette based only). Printed inlay cards supplied if required. Minimum order 10 cassettes. Price from 44p. Tel: MG Copies (MIG Recordings), Burntwood 75375 (24-hour answering service).

DRAGON HI-RES TEXT WRITER. Incorporate it in your own programs, on cassette, £3.95 including p&p. C.M.C. Software, 2/18 Braithwaite Road, Sparkbrook, Birmingham B11 1LB.

Here's my classified ad.

(Please write your copy in capital letters on the lines below.)

£0.20	£0.40
£0.60	£0.80
£1.00	£1.20
£1.40	£1.60
£1.80	£2.00
£2.20	£2.40
£2.60	£2.80
£3.00	£3.20
£3.40	£3.60
£3.80	£4.00

Please continue on a separate sheet of paper

I make this .... words, at 20p per word so I enclose £............

Name ....

Address..

....

....

Telephone ....

Please cut out and send this form to: Classified Department, *Dragon User*, 12-13 Little Newport Street, London WC2R 3LD

A
Abacus Software 54
Ampalsoft 15

B
Beyond Software 21
Brunton Software.............. 42
Butterworths 53

C
Cascom 58
Compusense 10 &11, 34 & 35
Computasolve 60

D
DACC 58
DRG Peripherals 55
Datapen............................ 56
Deltasoft 56

G
Games and Computers 24

H
Hot Co-Co 38

I
Interface 51

J
JCB Micro Systems 53
JLC Electronics 46

L
MC Lothlorien 51

M
M & J Software 58
MST Consultants.............. 44
Merlin Microsystems......... 40
Microcare 28
Microdeal.......... 2, 8, 36 & 68
Micro-De-Bug 58
Monster Software 58
J. Morrison (Micros).......... 40

O
Oasis Software............. 6 & 7
Oetistia 60
Oltrosoft............................ 60

P
Premier.............................. 2
Program Factory............... 44
Progressive Computers..... 56

R
Rainbow 53
Red Rom Data.................. 60

S
Sp Electronics 60
Salamander Software........ 67
Seconda Moore 13
Shards Software........ 32 & 46
R Shepherd Software 63
Slik Software 58
Softshop 60
Statacom 51

T
Tiger Software................... 54
Trojan Products................. 54
Tudor Williams.................. 60

V
Video Games International 5
Voltmace 48

W
West Devon Electronics 60
Windrush 30
Wintersoft......................... 62
Wizzard Software 54

Dragon Answers

Asking in confidence

AS I use my Dragon to run "business type" programs for a voluntary organisation, and as some of the information contained in these programs is of a confidential nature, to access the program the user is asked to input a "code" number.

The programs themselves work fine. The problem is, even if the user does not know the access code, by simply typing LIST and viewing the program, the number is displayed for all to see.

Therefore, is it possible to disable the LIST command, preferably from within the program? Or is there an alternative way to prevent this "way round" the code?

Also, initially I would like to keep a hard copy of the programs.

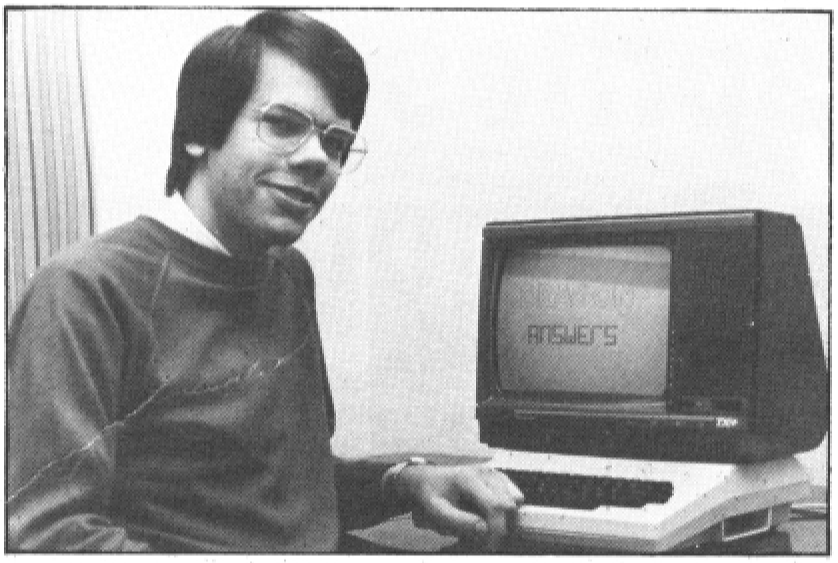
C Ward,
Accrington,
Lancs.

IT IS possible to disable any of the Dragon's commands, including LIST (and LLIST). The program listed on this page will do this for you if added to the beginning of your own program. Of course, once RUN even you won't be able to LIST the program, so make sure that it is totally bug-free.

The principle used is quite simple: the program alters the LIST and LLIST commands to act like REM statements by moving the command pointer down into RAM and altering the relevant addresses. In the same way, you would disable the CSAVE command to prevent anyone pirating your program.

```
10 CLEAR200,32620
20 TS=PEEK(291)*256+PEEK(292)
30 FOR I=0 TO 117
40 POKE 32650+I,PEEK(I+TS)
50 NEXTI
60 'DISABLE LIST
70 POKE 32650+42,134
80 POKE 32650+43,22
90 'DISABLE LLIST
100 POKE 32650+58,134
110 POKE 32650+59,22
120 FORI=0 TO 6:READA$:POKE
    32621+I,VAL("&H"+A$):NEXT
130 DATA 8E,7F,8A,BF,01,23,39
140 EXEC 32621
150 'REST OF PROGRAM....
```

Disabling the LIST command



Cartridge pinout

I HAVE just read in *Dragon User* about the booklet "Information for Machine Code Users". I would appreciate some information about this booklet.

If possible, I would also like information on the pinout of the Dragon cartridge port, as I want to drive my Eprom programmer, and also to communicate with my old 'KIM 1' computer, which has now been relegated to controlling the central heating.

I have had the Dragon for about six months now, and find it is good value for money. Unfortunately it all happens in drab black and white at the moment, as I am having technical difficulties with the interface to drive my Secam colour TV from the Dragon's PAL monitor output!

R Hayden,
Gonesse,
France.

THE "INFORMATION for Machine Code Users" booklet is produced by Dragon Data and is available free from their Customer Support Department. The booklet contains a much more comprehensive memory map than the one in the additional information booklet as well as the addresses of several useful machine code routines. The disk Basic and routines are not covered.

The Dragon's cartridge port connections are exactly the same as the Tandy Colour Computer's. All of the expected data, address and R/W lines are tied to this connector, together with several special purpose signals. It should be quite easy to connect your Eprom programmer with the necessary software to drive it. For the actual connection details, I suggest you get a copy of the Colour Computer Technical Reference Manual which is only 99p from Tandy's.

The monitor socket on the Dragon gives simple composite RGB with sound, not true RGB colour — this may be the cause of some of your problems. The pin connections are as follows:

Pin 1 — Video signal.
Pin 2 — Ground.
Pin 3 — Sound signal.
Pin 4 — Blank (not used).
Pin 5 — Blank (not used).

Stringing spaces

I AM having a problem with one of the String functions for the Dragon. I am not sure whether it is my understanding, the manual or my computer which is at fault.

I am using STR$(X) to put numbers into strings, the number is made into a string equivalent alright but a space is included at the beginning of each string, eg:

10 A$ = STR$(1234)
20 PRINT A$;A$

This gives:
▽ 1234 ▽ 1234 (▽ being space of course)

There is no indication of this in the manual. The only mention of STR$ is on page 70.

This feature causes problems when you want to combine number strings, eg:

10 A$ = STR$(20):B$ = STR$(30)
20 C$ = A$ + B$
30 PRINT C$

This gives:
▽20▽30 and not
2030 as expected

Can you give some guidance?

Chas Etchells,
Skegness,
Lincs.

WHAT THE STR$ function actually does is to put the string of characters that would appear on the screen into a variable. When the Dragon prints a number it makes allowances for the minus sign, hence a space is left if the number is positive.

Provided you don't want to use negative numbers in your strings, the solution is to use: A$ = MID$(STR$(A),2), instead of just A$ = STR$(A). This will cut out the leading space, but will also cut out any minus signs.

Looping foibles

AFTER executing the line
FOR X = 1 TO 5 STEP 0.01 ; ?X : NEXTX : ?X
the total error was almost 0.01.

Why has such a large error occurred when the loop is doing no processing except for printing out the loop count?

David Elliot,
Rochester.

YOU HAVEN'T discovered another error in the ROM, but you have raised an interesting point about the processing of a FOR-NEXT loop. Each time a NEXT statement is encountered, the relevant variable counter (in this case 'X') is incremented or decremented by the given value.

Only after this has been done does the Basic check whether the value is still within the boundaries given to continue the loop. Therefore, the value of a counter after a loop has been completed is always one step greater or lower than the given finishing value.

For example, if you try:
FOR X = 0 TO 500 STEP 100:NEXT X:? X
the value printed will be 600, and not 500 as might be expected.

Competition Corner

Answers to Competition Corner, *Dragon User,* 12/13 Little Newport Street, London WC2R 3LD

Bring sprites to your Dragon

***Gordon Lee** provides the puzzle, Premier the prize*

THE RECENT disclosure that a young American microcomputer enthusiast perfected a system which enabled him to win thousands of dollars at blackjack will have stirred up interest amongst micro-users generally. This is especially the case as the system was devised using only a standard personal micro, although this was later supplemented by the development of an elaborate system of concealed portable radio transmitters and receivers, linked to a miniature computer strapped to the operator's body.

Of course, for a long time anybody with a "winning system" has usually found it a sure fire way of losing vast sums of money. This leads us to enquire if it really is possible to perfect a system that works, especially if we have the aid of a microcomputer? Curiously, the game that is most commonly linked with so-called winning systems is the one in which the punter has the *least* chance of making a profit — namely roulette. The catch to the game of roulette is the 37th compartment on the wheel — the zero — which loses all bets to the house. This results in odds in favour of the house of $2^{12}/_{19}$ percent which means that, in the long run, the house will gain (and the punters lose) 26 pence for every £10.00 bet.

More usually, the punter with a system attempts to manipulate the *amount bet* rather than the outcome of the spin of the wheel, usually betting a higher amount following a loss, and a smaller amount after a win. Unfortunately all these systems fail in practice due to the additional rules regarding the highest and lowest bets allowable, and, of course, the zero bringing in relentlessly its 2 percent plus.

There is, however, one casino game in which the odds, on certain occasions, actually favour the player. The game is blackjack, and it was this game that caught the attention of the American mentioned earlier. Blackjack is almost identical to pontoon, and requires the player to get a higher point count than the dealer, but without the hand's value exceeding 21.

Advantage

The advantage to the player lies in the fact that the dealer has no option with regard to drawing further cards. If his count is 16 or less he must draw. If it is 17 or over he must stay. The player, on the other hand, has complete freedom of choice. But the greatest advantage to the player lies in the fact that at certain times, the player can have a higher than average chance of increasing his hand without exceeding a point value of 21. In practice, this means that every card dealt must be noted, and from this, by means of complex statistical formulae, it can be determined if conditions are favourable for the player at that point in the game.

Here is a form of roulette that won't be found in any casino. To play, draw a ring of numbers going clockwise from two to nine inclusive, with nine returning to two. Then choose a number between 100 and 200, and take this many chips. Now, enter the circle of numbers, beginning at number seven. If the number of chips in your hand is exactly divisible by seven then you must pay out $^1/_7$th of your chips. If it is not exactly divisible, then you *pick up* seven chips. This represents one move. You then move clockwise on to the next number, eight, and repeat the procedure — though this time if your chips are divisible by *eight* you pay $^1/_8$th, or, if not, you pick up eight.

The object of the game is to continue round and round until the number of chips in your hand is exactly 100. **Can you tell which number (or numbers) of chips you should choose to achieve 100 in the fewest possible moves?**

Prize

THIS MONTH'S prize is the new sprite graphics board from Premier Microsystems. The board provides 256 by 192 resolution, 768 programmable graphics, 16 colours, and 32 fully mixable screen display "layers" for building animated 3D effects. And the board also gives lower case letters along with a clearer display.

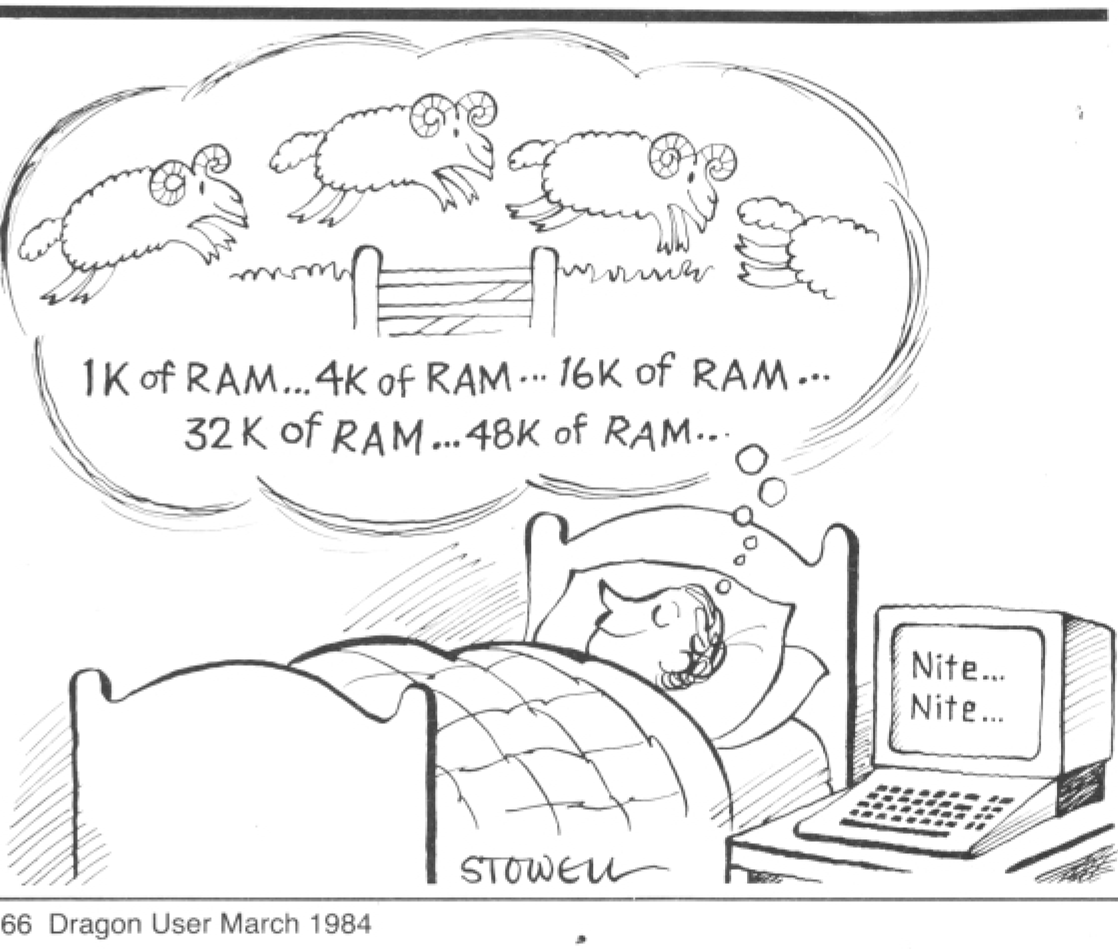
Rules

TO WIN the sprite board you have to send in the most elegant solution to the puzzle. You must show both the answer to the competition and how to solve it with the use of a Basic program developed on your Dragon. As a tie-breaker, complete the following sentence in 15 words or less: "I want to add a sprite graphics board to my Dragon because . . ."

Your entry must arrive at *Dragon User* by the last working day in March. The names of the winners, and the solution to the puzzle, will be published in our June issue. You may only enter the competition once. Entries will not be acknowledged and we cannot enter into correspondence on the result.

Winner

THE WINNER OF December's competition and recipient of a Dragon 64 from Dragon Data is R Bootman of Basingstoke. He correctly stated that the number of bicycles Santa should have written down was 13424896 — and suggested a heating management system as a Dragon 64 application.





TIRED of endless battles with orcs?
CONFUSED by interminable corridors and limitless caves?
BORED by all the same old adventures?
TRY The CRICKLEWOOD INCIDENT and Wings of War
two new and different adventures from Salamander Software.
In WINGS OF WAR you play Lt. Roger Wilcoe, reluctant hero. The time is November 1942 – you must parachute into occupied France, disguised as a German Officer, infiltrate a secret arms laboratory hidden in a chateau, steal the plans and the prototype of a new bomb, and make good your escape back to Blighty.
ROGER WILCOE
Star of Wings of War.
In THE CRICKLEWOOD INCIDENT, you, Arnold Q. Volestrangler the 14th heir to the Volestrangler fortune, find yourself bored out of your mind and looking for something to do until the laundrette opens. There's nothing for it but to leave your padded cell and search the wilds of London, Moscow, Hanoi and Wigan for the elusive Holy Grail. NOT for sheep of a sensitive disposition.
MAVIS NASTY
Not the star of the Cricklewood Incident.
Tape duplication by DATACLONE.
HG
GSH
Stimulate yourself for only £7.95 each.
Please add 50p p&p to all orders. Send A5 SAE for full catalogue.
Cheques or postal orders payable to:
Salamander SOFTWARE
17 Norfolk Road, Brighton, BN1 3AA Telephone: Brighton (0273) 771942
Look for these other new releases from Salamander Software
DRAGON – DRS (sophisticated database) £14.95
TURTLE GRAPHICS (Educational & fun) £9.95
BBC – EAGLE (original arcade action) £7.95
BBC/ELECTRON – TURBO COMPILER (BASIC compiler) £9.95
Now available are versions of our best selling 737 Flight Simulator for BBC disk and ACORN Electron.


MICRODEAL
PRESENTS A PANTOMIME
Cuthbert in Boots
LONDON 3 MILES
DRAGON 32
Cuthbert in the Mines
NEW
MICRODEAL
DRAGON 32
Cuthbert in the Jungle
BEST SELLER
MICRODEAL
DRAGON 32
Cuthbert Goes Digging
MICRODEAL
DRAGON 32
Cuthbert Goes Walkabout
MICRODEAL
On Cassette £8 each
Selected titles of MICRODEAL games available from larger branches of Boots